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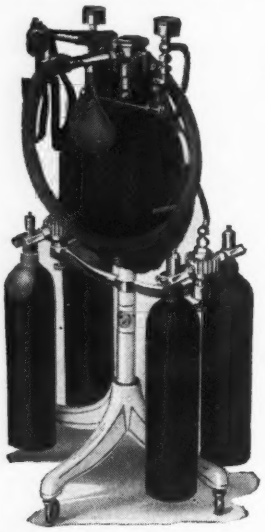

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VOL. XV ST. LOUIS, JULY, 1929 No. 7

ORIGINAL ARTICLES

PRESIDENT'S ADDRESS*

SOUTHWESTERN SOCIETY OF ORTHODONTISTS

BY DR. EDMOND B. ARNOLD, HOUSTON, TEXAS

ANY organization must have a leader, so custom has made it necessary that we have an occupant in the office of president. Custom has decreed that the president must inflict upon you an address, reciting your achievements during his tenure of office with suggestions for future progress, and has also decreed that your president's address be short that we may get to the more important business at hand. I shall endeavor to obey the dictates of custom. Our present program is definite proof of the value of our society. We were organized in Dallas in 1920, and from the original seven or eight charter members we now have a membership of over fifty, with over 75 per cent of the members represented on our program.

One very difficult problem is the large amount of territory covered by our society, making it necessary to travel a great distance to our meetings, which acts in opposition to the original plan of our society. We are at present confronted with additional territory desiring to join with us, with the attending possibility of our encroachment upon other sectional societies. Within the past year our northern members have discussed the advisability of enlarging our territory or in withdrawing and forming a Missouri Valley Society of Orthodontists. I must council you to act carefully on that matter. Our society was formed for the study of orthodontics, and any loss of membership lessens the number that will meet for study; yet if such a separation makes it possible for the formation of a more active membership in our northern territory, it would act as a benefit to all concerned. This matter should be definitely settled at our closing business session and your future

*Read at the ninth Annual session of the Southwestern Society of Orthodontists, Dallas, Texas, Jan. 2-5, 1929.

officers given full instructions as to what to do. We come now to another phase of our membership, those whom we term associate members. This list should include those outside our territory, even if they are in exclusive practice of orthodontia, and those inside our territory not in exclusive practice, and dues should only be assessed upon attendance at our meetings.

Our attendance for a number of years was 100 per cent. This has not been possible with the continued expansion of our society. Improvement along this line could be made if a majority of the meetings were held in as central a location as possible. It has been our policy, and should be, to limit the expenses of our society, as we have numerous other society demands, and additional revenue can be obtained by placing a penalty on those members who do not appear on our program. You recall that one of our by-laws states: "That for one to be in good standing he must present a clinic, case report, or a paper at each regular meeting, unless excused through official duties" and an added penalty of $5.00 should be assessed against any such members. At present our dues are $1.00 per year with an added assessment at each meeting to defray expenses. In fairness to all members this should be increased to avoid having our secretary-treasurer personally underwrite the expenses of our society from one session until the next. Any additional funds needed to defray the expenses would be assessed against those in attendance at the meeting. Our constitution and by-laws definitely outline and permit such changes if they meet with the unanimous approval of the members attending a regular session of the society.

Most of you have attended progressive clinics where everyone desiring to see the clinics was given the number of the table at which he was to sit. Then the clinician was given a specified time in which to demonstrate his clinic without any interruption from the spectators. There was also a specified time for questions; then the spectators would move on to another table. This not only avoids confusion to the members and clinicians and permits the members to see every clinic in detail but also avoids needless interruptions and repetitions of the clinics. Therefore, I not only suggest that we, the Southwestern Society of Orthodontists, adopt the progressive clinic presentation, but also as a society unanimously petition the American Society of Orthodontists to hold its clinics in this manner.

You are all aware of the fact that the American Society of Orthodontists meets in Estes Park, Colorado, from Monday evening until Friday afternoon, July 15-19, 1929; and as the president, Dr. A. H. Ketcham, is one of our honorary members, I sincerely hope that every member of the Southwestern Society, especially everyone who is a member of the American Society of Orthodontists, will attend this meeting, thereby giving the Southwestern Society a 100 per cent attendance. Another reason we should all attend is that fully 90 per cent of our members are members of the American Society of Orthodontists, and this is the first time the American Society of Orthodontists has ever held its meeting in our territory. It is not necessary to tell you of the scientific phase of the program as you all know what wonderful meetings they are, however, I feel I ought to tell you something of the entertainment features they are planning as well as the scenic beauty of

Colorado and Estes Park. I had the pleasure of motoring to Estes Park with Dr. Ketcham, Dr. Baker, Dr. Flesher, president, secretary and chairman of the Board of Censors of the American Society of Orthodontists respectively, Dr. McGinnis and Dr. Chapman in a motor bus furnished by the transportation company which will take the members from Denver to Estes. Words cannot express the beautiful scenery at which we gazed. I am not going to take up your time describing it as we have some slides so that you can see for yourself. The entertainment features include a big old-fashioned barbecue, and for the anglers I can personally guarantee that everyone who wishes to catch Colorado mountain trout can do so if he will go to a lake located just five minutes from our meeting place, because I fished there last summer and I caught them. Of course you do not want to catch too many as you pay for the fish per pound; however, after you have caught all you desire, you can continue catching and throw them back.

In closing, I must call attention to the marked improvement in the character of orthodontic service rendered in the Southwest in the past few years and make the claim for our little society that it should receive credit for this advancement. We are very appreciative of a large number of leaders in our profession, men of outstanding ability who have given generously of their time and money to meet with and instruct us. Our organization has made this method of study possible, and while so engaged there has developed among the members a bond of fellowship, friendship and cooperation which I can honestly state is not surpassed in any like organization. We have endeavored to avoid being led exclusively to any system, ism or special ordained plan and have striven to obtain the most good from the discussion of present day orthodontic teachings and practices. I am very happy to count myself among the members and am very appreciative of the high honor of serving as your president and predict that with the spirit of cooperation manifested by our members that our continued progress is assured.

A CONSIDERATION OF THE VALUE OF STEREOSCOPIC RADIOGRAPHY IN ORTHODONTIA WITH CLINICAL DEMONSTRATION OF TECHNIC*

By Jos. D. Eby, D.D.S., New York, N. Y.

I HAVE always regarded the New York Society of Orthodontists as being a clearing house in which the members should feel free to exchange their problems, opinions and ideas and to enjoy the wholesome criticism or discussion of any subject associated with the science of orthodontia. This being our home organization, the frequency of the meetings and the convenience of attendance indicate that we should look to our scientific programs to keep us fairly well abreast of general progress. I am sure that my experience must be common to all, i.e., that the good offices of this splendid and growing organization have been a source of varied and bountiful knowledge which has been of real benefit. I am sure that it is not out of order to venture an assertion on the pleasant manner which has attended our deliberations and contacts, and the degree of peaceable pursuit and the spirit of friendship which bespeaks of the success of our endeavors.

It is in this spirit that I wish to present informally for your consideration, frank discussion and criticism this morning something on the subject of the application of stereoscopic radiography as an aid in orthodontic diagnosis. I do not claim to possess much experience and have not investigated the literature very thoroughly. My hope in presenting these few views, demonstrating something of the technic and inviting a frank discussion, is to be instrumental in interesting a few who may carry this work farther along.

My experience in radiography began in 1902, and it is very interesting to note the great advancement and progress since that time. I am sure that those of you who manipulated the crude and clumsy apparatus of that period will agree with me that the vast strides made in the field of radiology to date are normal and sufficient. Expressing the same thought in a different way, I am sure that if any of you who were engaged in radiography prior to the year 1905 should have been taken away from it exclusively until the present time you would not be surprised at the degree of development which has occurred. At the same time I think we can all agree that radiology is still in its infancy. Doubtless the refinements which progress will bring during the next twenty-five years will entirely eclipse those which have essentially gone before during the past quarter of a century.

Stereoscopic radiography is nothing new. Its very status today, I am sure, is neither dwarfed nor distorted, nor has it been materially overrated. We are not living in an era of fads and hobbies. All things in the healing art receive well-calculated and definite consideration. Our profession is in much better status in this regard than it was twenty years ago.

*Read at a meeting of the New York Society of Orthodontists, New York City, Dec. 12, 1928.

I am deeply indebted to Dr. C. A. LeMaster, professor of radiology, Dental Department, St. Louis, University, for the information gained in the study of his masterly prepared book entitled "Dental Stereoroentgenography" published by the Southworth Company of Troy, New York. I am also deeply grateful to Dr. Leland Ray Johnson of Chicago, Ill., for the use of a copy of his thesis entitled "A Study of the Technic and Utility of Stereoroentgenography with Reference to Orthodontia." This thesis was prepared at Northwestern University and was called to my attention by the favorable comment of Dr. Frederick B. Noyes . . . . Quoting these gentlemen largely in a brief review of the history of the applied mathematics of stereoscopic photography to the field of radiology, credit is first given to Dr. Elihu Thompson who first suggested its use in this combination in 1896. At a slightly later date Sir James Mackenzie Davidson of London farther developed the idea. Since that time it has become a common practice among general radiologists throughout the world.

Dr. Eugene Wilson Caldwell of New York City was among the early investigators in this field and in 1902 developed a hand stereoscope for the viewing of large negatives when properly related and transilluminated. This instrument has not been improved upon by any of the larger stereoscopic machines of today. While this is true with reference to the entire body, very little has been done about the teeth.

Records reveal the fact that Dr. C. Edmund Kells produced the first dental stereoscopic radiographs in 1903 and presented a paper before the National Dental Association on the subject. The profession was slow to take it up, and a very interesting observation may be partially accountable as the reason. Those of you who knew Dr. Kells know very well that he was an ardent devotee of fine detail in the things which claimed his interest. It seems that his technic was so elaborate and complicated in an effort to be exact as to be discouraging in practical usage. He again brought the subject to the attention of the profession in 1912 without stimulating much progress.

In 1924 Dr. Clarence O. Simpson presented a concise technic, and in the same year an exceptional article was presented by Dr. C. A. LeMaster. I think it is only fitting just here to pause for a moment to pay silent tribute to Dr. C. Edmund Kells as one of the great benefactors of dentistry and ultimately a martyr to the cause of radiography.

While I do not know all the men who have made contributions to stereoscopic radiography in dentistry, it would be unfitting on this occasion not to call attention to the thorough and capable work of Dr. Frank T. Van Woert, and I am quite sure that his investigations were carried on under the knowledge and with the assistance of Dr. Leuman M. Waugh. I have not found anyone who has become enthusiastic in overrating the values of stereoscopic radiography, but everyone seems to be sanguine as to its practical value and future perfection. I believe that Drs. Van Woert and Waugh reached the conclusion that several radiographs of the same object taken from different positions would reveal any local or regional conditions equally effectively. I trust that Dr. Waugh will correct any misimpressions I may leave with these statements, as I have included them for that purpose.

During the period following the cessation of the World War many of us were fraught with harassing experiences in our efforts to locate and remove foreign bodies in the face and elsewhere. The cross-sectional study of missiles through the maxillofacial areas of flat radiographic shadows were so frequently misleading that after the most careful study, and unless some neighboring anatomic landmark was only too apparent, the most carefully planned operations would defy the detection of the object. Our experiences were that stereoscopic radiograms were considerably more effective, but I would not mislead you into believing that they were by any means assuredly acurate. As a matter of fact the only accurate method discovered was with the use of the fluoroscope. With the fluoroscope the head could be moved into innumerable positions and a mark made in the line in which the object was seen. It stood to reason that the convergence of these marks represented the exact locality, and a careful study of approach would generally find the object sought.

A simple radiograph is a record of superimposed shadows. LeMaster states that it may be described as a record of shadows cast by objects which are placed between an x-ray tube in action and a sensitized plate or film upon which are recorded the shadows. In other words, a shadow record of an object possessing cubic dimensions deposited in layers on a flat surface. The density of these shadows is in direct ratio to the resistance which the objects offer to the passage of the ray, and it is often impossible to determine the relative position of the different substances which these shadows represent. Dr. LeMaster further defines the stereoradiograph as being a record of shadows cast by objects which are placed between an x-ray tube and sensitized plates or films, two in number, upon which the shadows are recorded. One plate records the shadows cast when the central ray passes from the focal spot of the target at an angle corresponding to the angle of vision of the right eye. The other plate records the shadows cast when the central ray passes from the focal spot of the target of the x-ray tube at an angle corresponding to the vision of the left eye. With the records of shadows from both angles of vision viewed through a suitable apparatus, the stereoscope, the two radiographs fuse into one. This produces the ability to grasp the identity of the objects in this field of shadows with a definite view of the third dimension, thus restoring recognition of volume, form and position.

The most encouraging thing to my mind in recent developments in stereoradiography is the satisfaction which has followed the endeavor to simplify matters and the making of a hard task easy. Through this fact my hopes in the future value of this work in orthodontia are well founded. I do not think there is anyone in this room who will gainsay the fact that he will not note a definite stereoscopic effect in the specimens we have to present. If it is true that you do grasp the sense of the third dimension, then it is true that stereoscopic radiography exists, has a value, and may be further perfected.

I do not think there is anyone who has placed any faith in the stereoscopic radiograph but will confess his opinion that it is still in its infancy and remains to be very greatly improved upon. I cannot help but feel that future perfection will make the things which we note in its use today only casual.

I believe the time will come when the use of the stereoscopic radiograph in orthodontia will become such a constantly practiced routine that the experienced eye will begin to note the variations observed in the macroscopic study of the structure of bone substance and other fine points of observation which will have a tremendous influence on the more enlightened practice of orthodontia. This may be a big guess but I cannot help but feel that it is possible.

Some of the advantages which are to be gained from the careful study and use of stereoscopic radiographs appear to me as follows: study of impacted teeth; study of unerupted teeth; relation of the roots of superimposed teeth; study of the roots of teeth which defy movement; all forms of anomalies; all forms of pathologic processes; study of the conditions around pulpless teeth, including root canal fillings, etc.; study of lamina dura and the bony septa; study of palatal suture; study of the character of general bony structures surrounding the teeth; study of the accessory sinuses; study of foreign bodies; study of the location of springs placed for the eruption of impacted teeth; search for cavities; study of the fit of bands.

The technic I believe to be simple and well along the road of definite progress. I believe it belongs to the fitness of things that our appreciation and confidence should be expressed to those manufacturers of radiographic apparatus who are developing this mechanism for us. We should be willing to lend them our patient consideration and the benefit of our constructive suggestion that they may not be led too far afield in their efforts to render assistance.

Dr. J. Lowe Young has been lending his experience and skill to a thorough investigation of stereoscopic radiograph in order that he might determine its value to him. I hope that he will give you the benefit of his experiences with some opinions and suggestions.

121 East Sixtieth Street.

FURTHER FINDINGS IN VERTICAL DEVELOPMENT*

By Dr. Robert Dunn, San Francisco

IN TWENTY-FIVE years of infantile struggling, the orthodontic profession, as a whole, has yet been unable to throw off its swaddling clothes and in its efforts to overcome its limitations and failures grasps at fanciful theories and methods without any apparent analytic reasoning, and may be likened unto the proverbial drowning man and the straw. 'Tis true we have striven for and almost reached mechanical perfection but with no apparent progress as to proved causative factors nor diminution of time in treatment or appreciable lowering in the percentage of failures, a sad commentary. This statement may be confirmed in the answers to questions as compiled by Dr. B. Frank Gray and published in the International Journal of Orthodontia, Oral Surgery and Radiography of December, 1927.

At last it appears there is to be a genuine effort toward solving some of our aggravating problems as attested by the financial contributions of members of this and other organizations toward research work, also the deliberations of this meeting and which we sincerely hope is but the forerunner of continuity of efforts not only in investigations of aggravating problems but an evaluation of the now generally accepted theories, many of which the writer is confident will thereby be discarded.

In prior presentations on vertical development before this and other organizations, it appears that I have possibly been a little premature; the profession was not ready for the question, being thoroughly impregnated with the idea of mechanical contrivances as the one great panacea for their ills. However, in the light of this important undertaking in research work, it seems most opportune to present for your consideration my further findings in the study of vertical development and incidentally other diagnostic features, the result of such study pertinent to our work, trusting it will receive your interest and cooperation to the end that we may enter the treatment of such cases with full confidence of their ultimate satisfactory conclusion and that within a reasonably limited time.

In my study of arrest of vertical development in molar and premolar regions, the following observations have become firmly fortified in my mind and now only require a little further systematic research work for full confirmation.

What bearing faulty metabolism and malnutrition have in these cases has not as yet been determined. It is found, however, just as prevalent in children with all indications of normal metabolism and nutrition. The dominant factor is mechanical, and whether primary or secondary, responds readily to corrective measures when once understood.

*Read at the Meeting of the Pacific Coast Society of Orthodontists, Feb. 20, 21, 22, 1928, San Francisco.

Arrest of vertical development in molar and premolar regions is almost entirely confined to the mandible and because of the mobility of the latter is undeniably the greatest known factor in producing malocclusion of the teeth. Through its presence, an otherwise apparently normal developing dental apparatus of today will and does migrate overnight, as it were, into a pronounced case of malocclusion. It is present in varying degrees in all cases of Class II and a large percentage of Class I and is invariably associated with a strained or abnormal condylar relation and first molar rotation; where associated with mouth breathing as in Division 1, Class II, the former is the cause and the latter the effect as is amply proved when the case is properly treated; mouth breathing, like the pacifier, being a hypothetic factor. Lack of sufficient vertical development is responsible for by far the largest percentage of our failures; it is also the cause of impacted third molars, traumatism through cuspal interference in the excursions of the mandible, pyorrhea alveolaris and other ills. Its relation to bilateral distoclusions is most significant and in unilateral distoclusions is associated with pronounced condylar misplacement. The unilateral distoclusions are nothing more or less than rotated mandibles and should be so treated. The movement of teeth independent of its condition of rotation is wrong and leads to much unnecessary treatment and unhappiness through failures. Their inception, except in prenatal cases, is during the eruption of the first molars and occasionally the second deciduous molars. Undoubtedly, many so-called mesial occlusions of teeth in the lateral halves of the maxilla, particularly unilateral, are but optical illusions or conclusions derived through misapplied instruments of calculation. Proper vertical arrangement of the mandibular teeth as an important factor in the development and maintaining of the symmetrical contour of the human features is axiomatic.

In this study of vertical growth, it has been determined that the mandibular incisors are invariably normal in their vertical arrangement, excepting in pathologic conditions as pyorrhea alveolaris, etc. Where extensive crowding prevents their full eruption, one or more of the incisors will be found normal. They are intended as a guide or fixed point by nature in the development of the dental space and condylar relation in the infant, and in the permanent denture in conjunction with the first molar and condylar relation are pivotal points for the development of the dental apparatus to an harmonious state, and the formation in the process, of the compensating curve of Spee for the guiding and maintaining of the mandible in its proper relation to the maxilla and cranium during its excursions and at rest.

The mandibular incisors when forced by mechanical appliances to positions of infraocclusion will invariably return after being released, to their typical vertical arrangement and if sufficient vertical development in molar and premolar regions, has not been obtained and molar rotation corrected, the efforts of the orthodontist will not be a success.

Owing to the extent of the subject and the time that would be required for presentation, the detailed description of and the explanation of the manner of development of the various types of cases coming under arrest of vertical development will be left to another time.

I will state, however, that in the diagnosing of these cases we must be able to differentiate into three main or important types. First, those (and the most prevalent of all) where the arrest of vertical development in molar and premolar regions is associated with the distal position of the mandible and strained condylar relation. Teeth in bilateral or unilateral distoclusion. The second type which in addition to the foregoing involvements, the teeth and alveolar process in the mandible have apparently developed anteriorly and as a whole to the body of the mandible. And third, those of prenatal origin. In the latter type the body of the mandible is arrested in its antero-posterio development as well as vertically and attempts at correction unless begun very early in life with periods of rest over an extended time will result in but slight improvement, most always in failure.

In the second type the correction is more difficult than in that of the first, due no doubt to the unnatural relation of the teeth to the mandible proper which prevents the establishing of full harmony in the occlusion of the teeth with mandible and condylar relation, the latter being left in a more or less strained position. The effect after treatment in the facial lines is also any-

Fig. 1.

thing but pleasing, giving the appearance of an arrest of the mandible in the region of the chin, which in reality is not the case, the body of the mandible being normal but distal to its proper place, the ugliness amplified by strained muscular tissues. Intelligent very early treatment will largely overcome the condition with resultant pleasing facial contour.

It is useless, however, to expect more than an improvement in cases of this type after the sixth year or the eruption to place of the permanent mandibular incisors, and treatment should never be undertaken unless the patient and parents are apprized of that fact.

In the third main type or those of prenatal origin, to be successful one must begin as early in life as is possible to handle the patient and then success will depend upon the skill of the operator and his understanding of the three cardinal points so necessary in the final development of the dental apparatus to an harmonious whole.

It was not my intention to present anything in the way of appliances, but as there are cases which require immediate action on presentation I will show what has proved in my hands to be the most efficient appliance I have ever come across in assisting in overcoming arrest of vertical development

in very young patients. It is not to be accepted, however, as a final and ideal appliance for it has its limitations as have all others. It is after the design of Carl Engstrom of Sacramento. (Fig. 1.)

Bands which do not show in the illustration, are fitted to maxillary first molars, and to which are soldered to mesiobuccal angles, half staples for the reception of the spring wire encircling the distal and buccal surfaces of the molars. The spring wires which are anchored in the vulcanite plate are of gauge 038 and may be adjusted to rotate the molars, tip them mesially, move them buccally or lengthen them. A broadening of the maxillary arch may also be brought about through adjustment downward of the springs, coupled with occluding mandibular incisors upon incline plane of plate.

Additional rubber should be added to the incline plane from time to time through revulcanization, as opening the occlusion too abruptly is not good policy for much damage may be done by a too severe strain upon the mandibular incisors and the object defeated. Intelligently handled, it will be found that in many cases, with the aid of muscular exercises, no other appliances will be found necessary to bring them to a successful conclusion.

In my observations where adenoids and enlarged tonsils have caused mouth breathing, an overdevelopment in the vertical arrangement of molar and premolars exists instead of an arrest of vertical development as is found in those cases of malocclusion generally attributed to adenoids and enlarged tonsils. It will be noted that mandibular incisors are invariably normal as to vertical arrangement and the excessive vertical development is entirely in the molar and premolar regions of the maxilla, indicating that in cases of malocclusion caused by mouth breathing from adenoids and enlarged tonsils, the mouth being open the greater part of the time, over vertical development in molar and premolar in the maxilla is the rule.

In conclusion, one might ask, is this condition an indication of nature's reversion to another type, or should we say evolution? Sometimes it looks that way. In any case, this much is certain, that there is a definite correlation of the first molar and temperomandibular articulation to the mandibular incisors in their vertical arrangement in the development of normal occlusion of the teeth, and when once understood and definitely determined in a given case (and which must of necessity be through the use of an efficient instrument of the nature of an articulator) the simplicity of it all will be most amazing. The obtaining and maintaining of this balanced relation in the three points mentioned in the treatment of cases of mixed dentures and of the types under discussion, will permit of the development of the dental apparatus to an harmonious whole and without further mechanical interference.

Finally and digressing, may I add the following: the orthodontic profession is sadly in need of a practical instrument for the determination of proper adjustments of appliances where used for the purpose of exertion of force upon the teeth. The present general procedure is little more or less than guesswork and is most unscientific. Failure to control and place molars in proper relative positions (and which cannot always be determined by the eye) is another common cause of failure so often blamed on other factors.

DISCUSSION

Dr. H. L. Morehouse (Spokane).—I am not going to enter into a very lengthy discussion of Dr. Dunn's paper, first because the time is a little short and we all want to hear the rest of Dr. Rogers' paper and address and second, because Dr. Dunn has, with his slides and explanation, gone into it very fully. I am only going to emphasize a few points and disagree in one or two instances with Dr. Dunn in some of his cases. First, just part of a quotation to call attention to a part of Dr. Dunn's paper which I am going to bring out for discussion, when he said, ". . . with all indications of normal metabolism and nutrition," in connection with faulty development.

I think that we guess at this question of a normal metabolism and nutrition too many times in our patients. I know I do myself, and I know from now on I am going to have my patients examined more carefully when I suspect a lack of balance in metabolism or in proper balance of nutrition of a child. I am going to have them examined so as to be more certain as was brought out in one or two papers yesterday, that although the individual might look strong and robust, still when a thorough examination of those cases is made, something might be found lacking. I think we want to be very careful in guessing at the fact, or coming to a full conclusion that our patient is OK along those lines, because I feel that this is one of the primary features and causes of our failures in getting the proper results in our treatment, as well as in the final result in the case.

Another point I want to emphasize and on which I fully agree with Dr. Dunn is the question of the movability of the mandible. I think Dr. Dunn has pointed out to us one of the important points and if you will follow Dr. Rogers' lecture, you will find it runs along in the same trend, of the movability of the mandible in its excursion causing a great many of our anomalies.

I disagree with Dr. Dunn's remarks regarding the lack of vertical development causing the impaction of the third molars. As many of you know, especially the older men, the third molar has been a hobby with me for a good many years and I have followed it very carefully and have made the same remark to you for a number of meetings. If you will take your radiograms of your patients about ten years of age, or sometimes even a little bit earlier, but at least by ten years of age, you will discover the crypt of the third molar and the germ of the third molar developing. If you will follow the radiograms from time to time, you will find this third molar remaining at the same angle right through its development up to the time of nineteen or twenty years of age, or whenever that third molar has to be removed, because if it is in an impacted position, it is impacted because of the deposition of the tooth germ at the time of beginning its development, due, I think, to the course of evolution in the human race, of the shortening of the mandible from the lack of need and use of our muscles of mastication, so I do not feel that impaction of the third molar is due to lack of vertical development, but I contend continually that the third molar, if it is impacted, is impacted at the time of its deposition and nine times out of ten, it will grow worse rather than better.

Dr. Dunn spoke about the proper vertical development as an important factor in developing and maintaining of symmetrical contour of the features. That does not need to be discussed. I do not need to go into that question any more fully because, as I stated a moment ago, Dr. Dunn's illustrations and Dr. Rogers' illustrations as you see them from time to time will fully convince you that the question of vertical development is one of the prime factors in the proper balance and symmetrical development of the individual features.

The one great question in my mind in all this work is where the change takes place, in the mandible, or in the development of the case, whether we get a change in the glenoid fossa as the mandible is brought forward, or whether by bringing the mandible forward bodily, whatever means we take to do it, we get a temporary change in the excursion of the glenoid fossa and finally a change in the ramus of the jaw, as well as in the mandibular part; but I have always felt, and I think possibly, after seeing some of Dr. Rogers' slides here, that I am wrong in the fact that most of the change comes in the region of the glenoid fossa in the condyle. I think it comes there temporarily, but is later on developed in the mandible proper and the condyle drops back into its normal relation and former position in the glenoid fossa.

The vertical development of cases in orthodontia has grown on me more and more in the last few years because I have found greater success, and when I say greater success, I mean final success of my cases in those cases where I was able to bring about the vertical development as it should be, because then I seldom ever get the return, or any unbalancing of the arches as happens where vertical development is not obtained. I carry the question of vertical development on more and more in all of my cases lately than I have heretofore.

President Dinham.—The paper is open for general discussion. If there is no further discussion, we will ask Dr. Dunn to close.

Dr. Dunn.—I have nothing further to add other than to state to Dr. Morehouse that I believe we will find that where impaction of third molars exists in cases of the types under discussion, it is due to an arrest of development, anteroposterior, in the region of the angle of the ramus. This is the result of the arrest of vertical development in mandibular molar and premolar regions and the relation of mandibular incisors to maxilla. In fact, it becomes self-evident when on proper treatment of these cases and in due time the third molars erupt with little or no difficulty.

PALEONTOLOGY OF THE HUMAN DENTITION*

By Prof. William K. Gregory and Dr. Milo Hellman, New York City

FAMILY TREE OF MAN

THE EVOLUTION AND RELATIONSHIPS OF THE PRINCIPAL BRANCHES OF MANKIND AND OF ANTHROPOID APES

BASED ON A CAREFUL WEIGHING OF VARIOUS LINES OF EVIDENCE

As yet we know but little of the direct fossil ancestors of man, but the fossils represented by stages 1, 2, 3, 4, 5, 6, 7, of this "Family Tree" are important milestones along the immensely long road of man's evolution.

Man's ascent from the lower primates has been a struggle upward toward better brains, better intelligence and better morals. Through the improvement of the frontal lobes and other parts of the brain, in the later stages of his history, Man is slowly overcoming his selfish impulses and awakening to the vast possibilities of advance through the spirit of mutual tolerance and helpfulness.

William K. Gregory, 1924

THE ANTHROPOID APES

Among all living animals the anthropoid apes, especially the gorilla and the chimpanzee, come the nearest to man, not only in general appearance, but also in the peculiar anatomical characteristics of their skulls, teeth, backbone, of the muscles of the face, back and limbs, as well as in the form and arrangement of various internal organs. Moreover, in the mode of reproduction and in the course of development within the body of the mother the anthropoid apes reveal the most unmistakable marks of close relationship with the remote ancestors of mankind. They are also the only animals which show the beginnings of human intelligence and their brains, while distinctly inferior to those of the lowest existing races of man, are superior to those of all other mammals. For these and many similar reasons the existing apes are recognized as man's nearest surviving relatives, or to put it another way, man and the various existing anthropoids are regarded as the diversified descendants of a long extinct group of primitive anthropoids.

KEY TO STAGES

1. Primitive Primate (*Notharctus osborni*). Fossil skull and jaw, slightly reconstructed, of Eocene age, Wyoming, U. S. A. Original in American Museum of Natural History, New York.

2. Prototypal anthropoid. Reconstruction, based on fossil jaw (*Propliopithecus hæckeli*) of Oligocene age, Egypt. Original jaw in Stuttgart Museum, Germany.

3. Primitive anthropoid. Reconstruction, based on fossil jaws (*Dryopithecus frickæ*, etc.) of Miocene age, India. Original jaws in American Museum of Natural History, New York.

4. Trinil Ape Man. Reconstruction, based on fossil skull-top (*Pithecanthropus erectus*) of Upper Pliocene or Lower Pleistocene age, Java. Original in Teyler Museum, Haarlem, Holland.

5. Piltdown Man. Reconstruction, based on fossil skull and lower jaw (*Eoanthropus dawsoni*) of Pleistocene age, England. Original in British Museum (Natural History) London.

6. Heidelberg Man. Reconstruction, based on fossil jaw (*Homo heidelbergensis*) of Lower Pleistocene age, Germany. Original in University of Heidelberg, Germany.

7. Neanderthal Man. Fossil skull and jaw, slightly restored, of the Old Stone Age, Europe. Originals in Paris Museum of Natural History.

8. Cro-Magnon Man. Fossil skull and jaw, slightly restored, of late Palæolithic age, France. Original in Paris Museum.

9. Australian black-fellow. One of the most primitive of existing human races.

10. Hottentot. Representing the Negro group of races.

11. Chinese. Representing the Mongolian group.

12. American. Representing the Caucasian group.

a. Gorilla, Africa.
b. Chimpanzee, Africa.
c. Orang-utan, Borneo.
d. Gibbon, India.

Reconstructions by J. H. McGregor (Nos. 4, 5, 6, 7, 8), M. Roigneau (No. 2), and O. Falkenbach (Nos. 1, 3)

Fig. 1.

*Presented before the First International Orthodontic Congress.

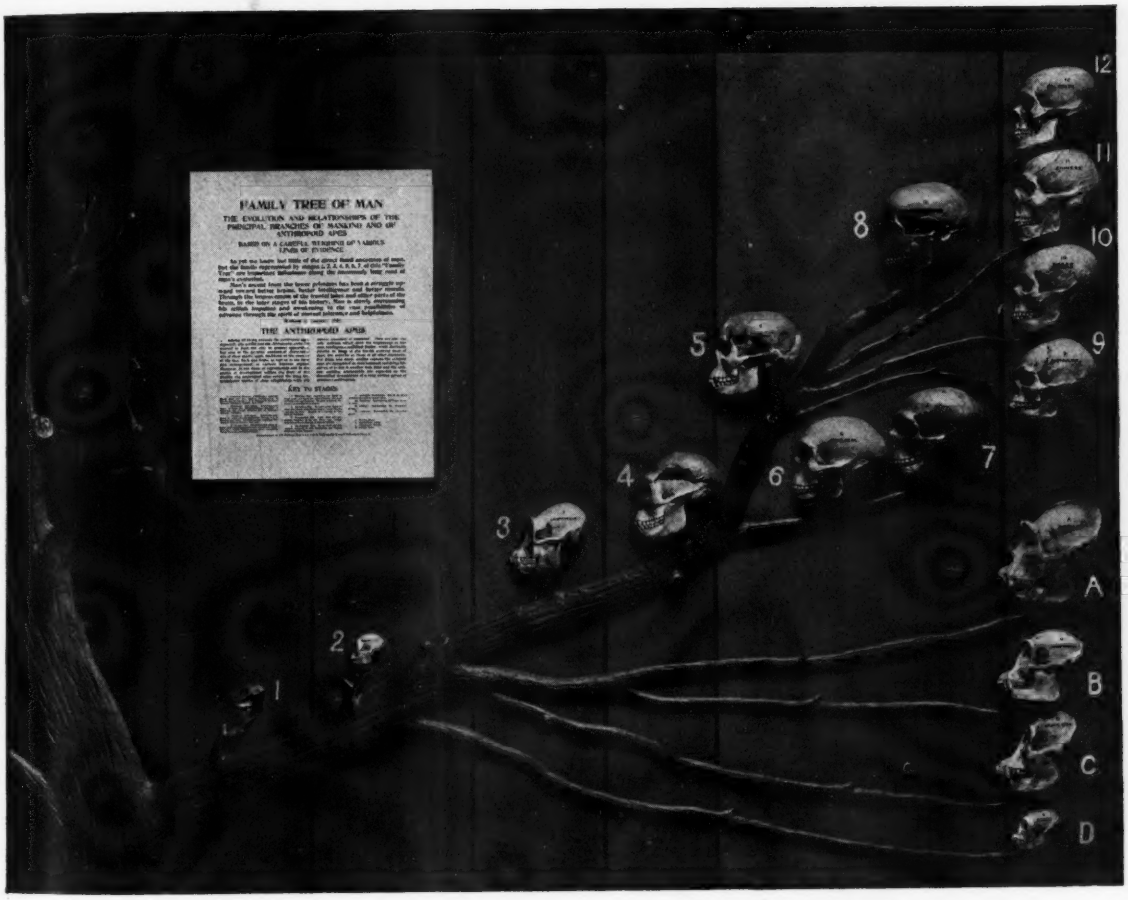


Fig. 2.—Family tree of man. Relationships of the different branches of the human and anthropoid stocks as inferred from the evidence of comparative anatomy and paleontology. (See Chart, Fig. 1.)

Fig. 3.—Incomplete fossil jaws of *Dryopithecus*. *A. Dryopithecus frickae.* From Middle Siwalik of India. *B. Dryopithecus cautleyi.* From lower levels of Middle Siwalik of India. *C. Dryopithecus fontani.* Cast. From Upper Miocene of France. All figures natural size.

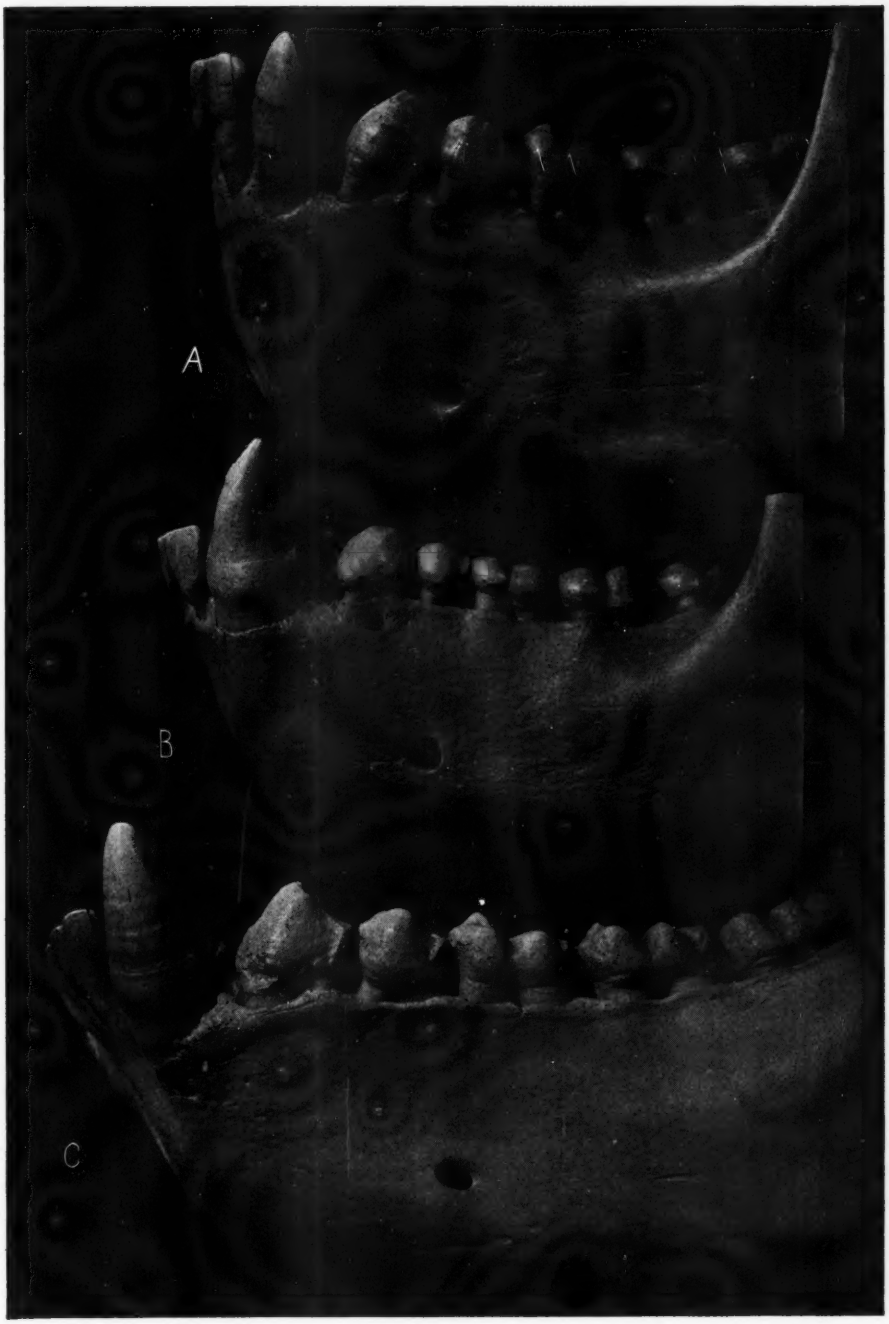


Fig. 4.—Anthropoid mandibles. *A*. Orang-utan. *B*. Chimpanzee, from Avakubi, Belgian Congo. *C*. Gorilla, from Quesso region, Median Congo. All figures natural size.

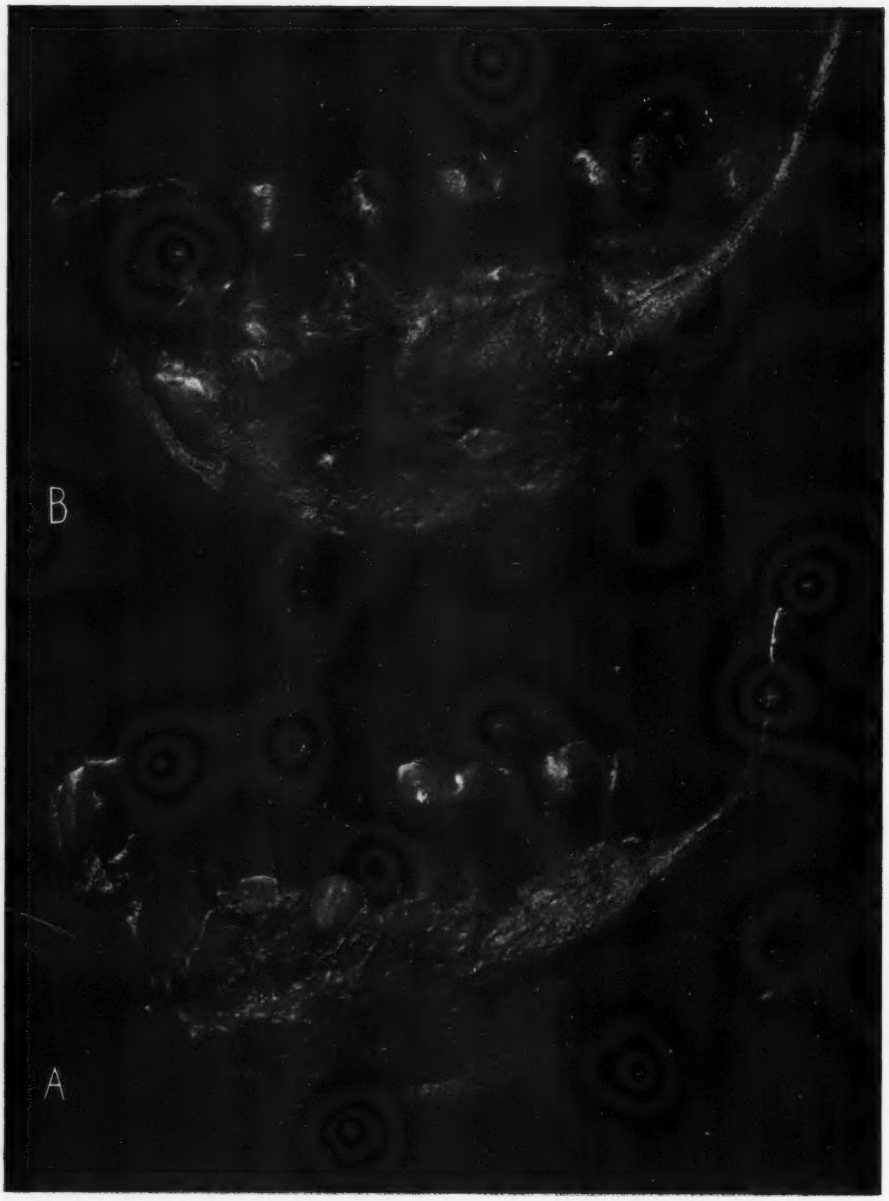


Fig. 5.—Fossil Neanderthaloids. *A*. Ehringsdorf child. *B*. Mousterian Youth. Both figures X 4/3.

Fig. 6.—Human mandibular jaws. *A, B, C. Homo sapiens.* Indian from Tarasco, Northern Mexico.

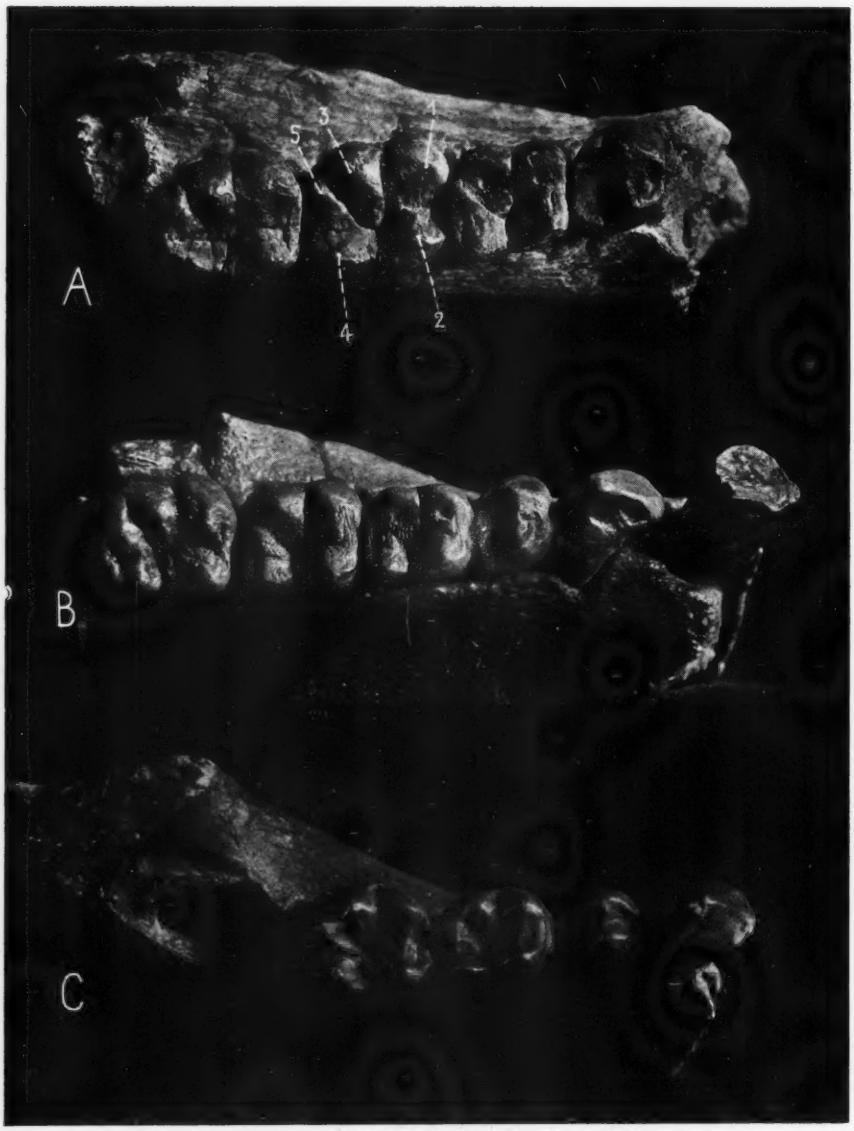


Fig. 7.—Incomplete mandible of fossil *Dryopithecus*. Crown view of left ramus. *A. Dryopithecus frickae. B. Dryopithecus cautleyi. C. Dryopithecus fontani.* Cast. All figures X 4/3.

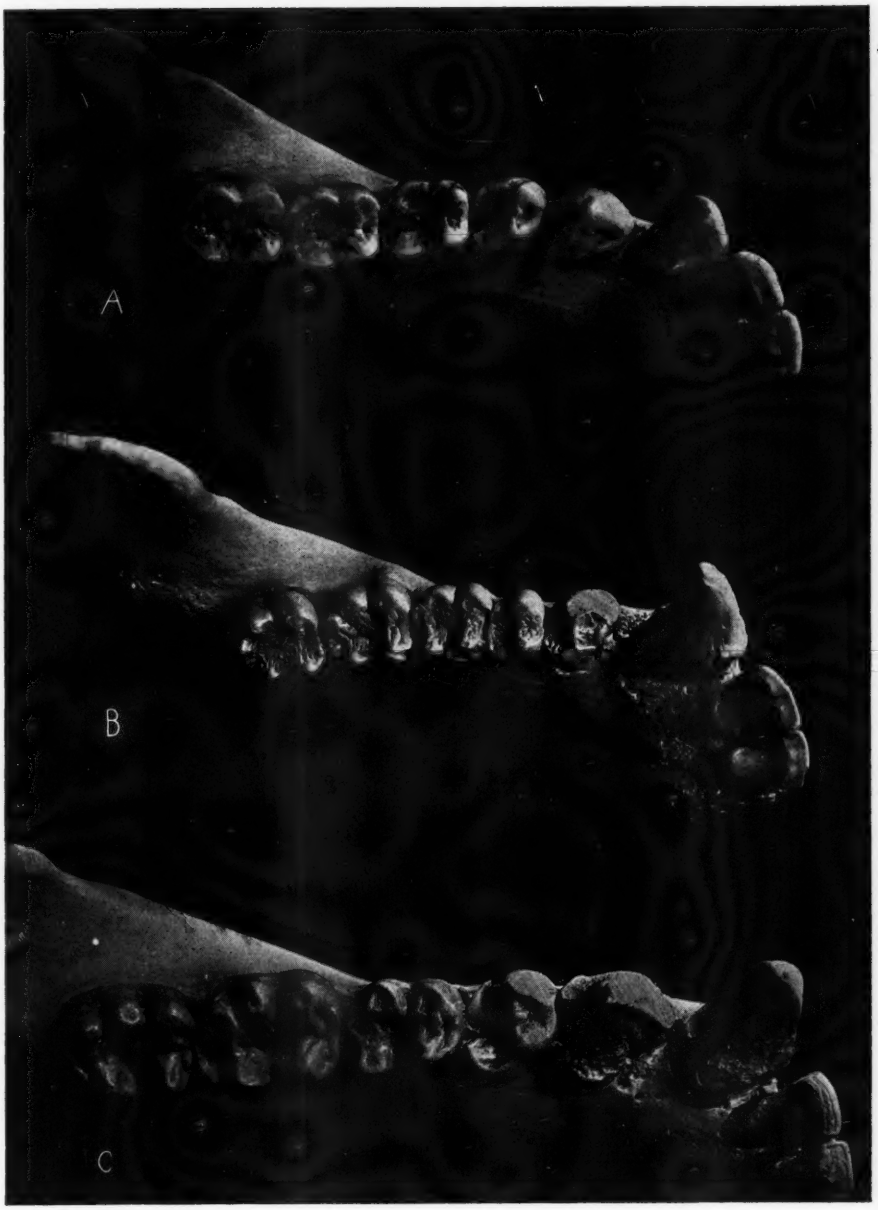


Fig. 8.—Mandibles of anthropoids. Crown view of left ramus. *A*, Orang-utan. *B*, Chimpanzee, from Avakubi, Belgian Congo. *C*, Gorilla, from Quesso region, Median Congo. All figures nature size.

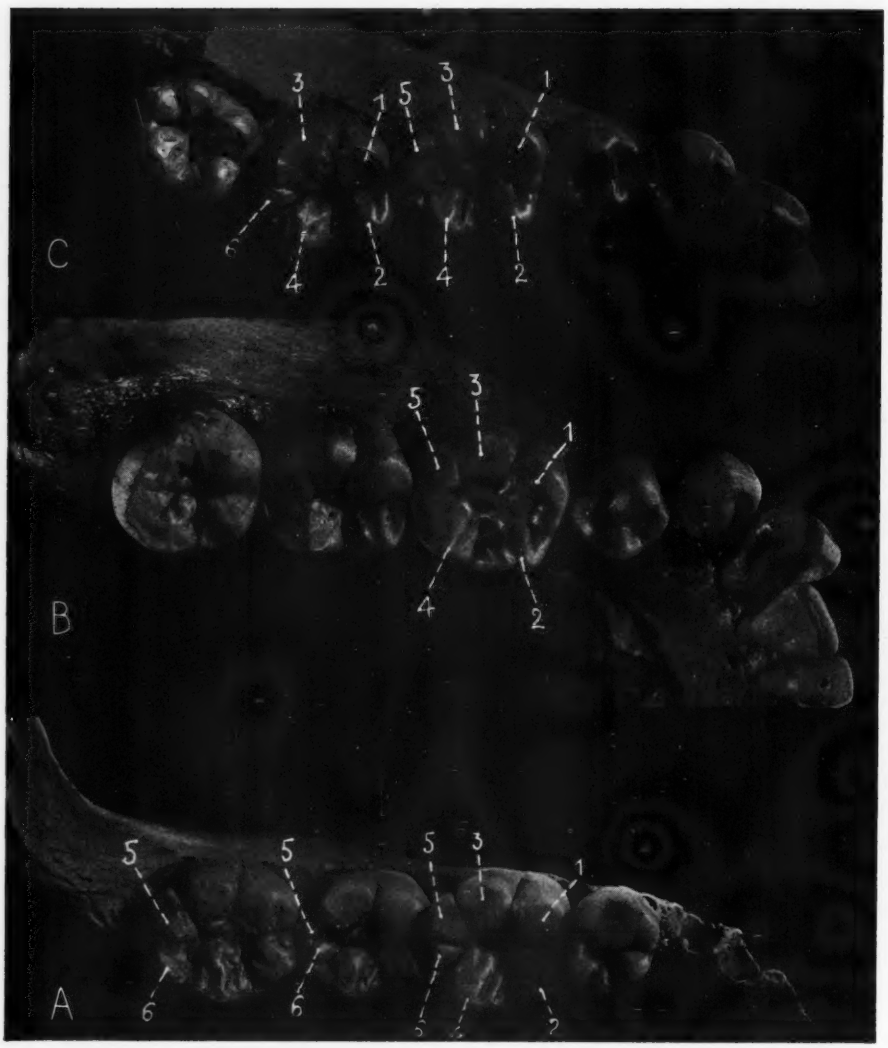


Fig. 9.—Mandibles of modern men. Crown views of left ramus. *A. Homo sapiens.* Australian aboriginal. *B, C. Homo sapiens.* Indian from Tarasco, Northern Mexico. All figures X 3/2.

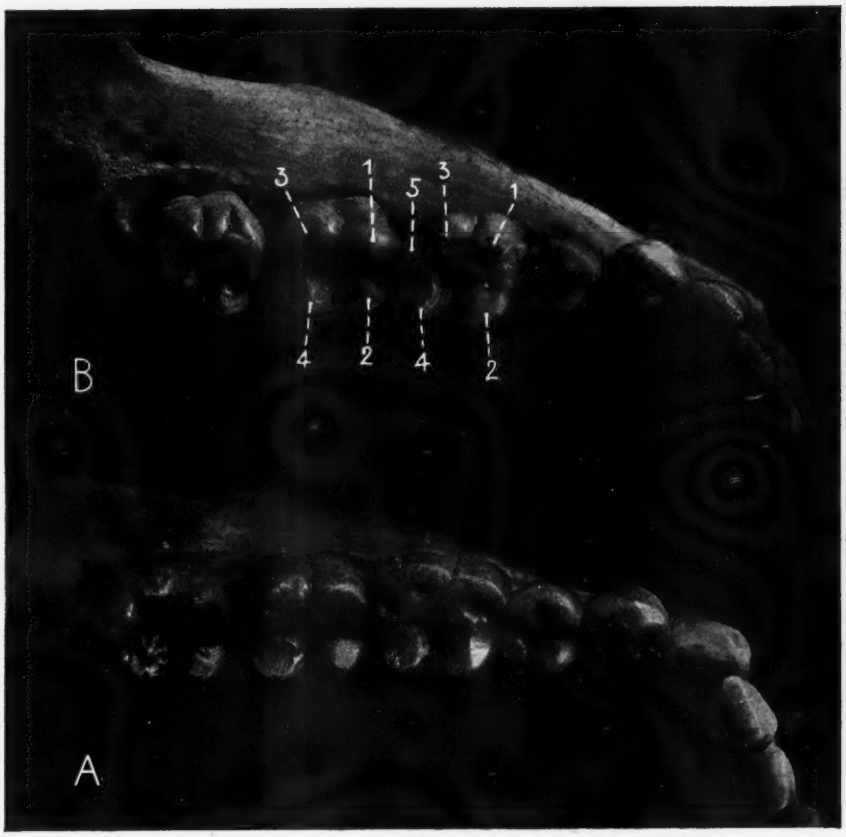


Fig. 10.—Mandibular jaws of modern men (continued). *A. Homo sapiens.* Hindu from Eastern India. *B. Homo sapiens.* White man. Both figures X 3/2.

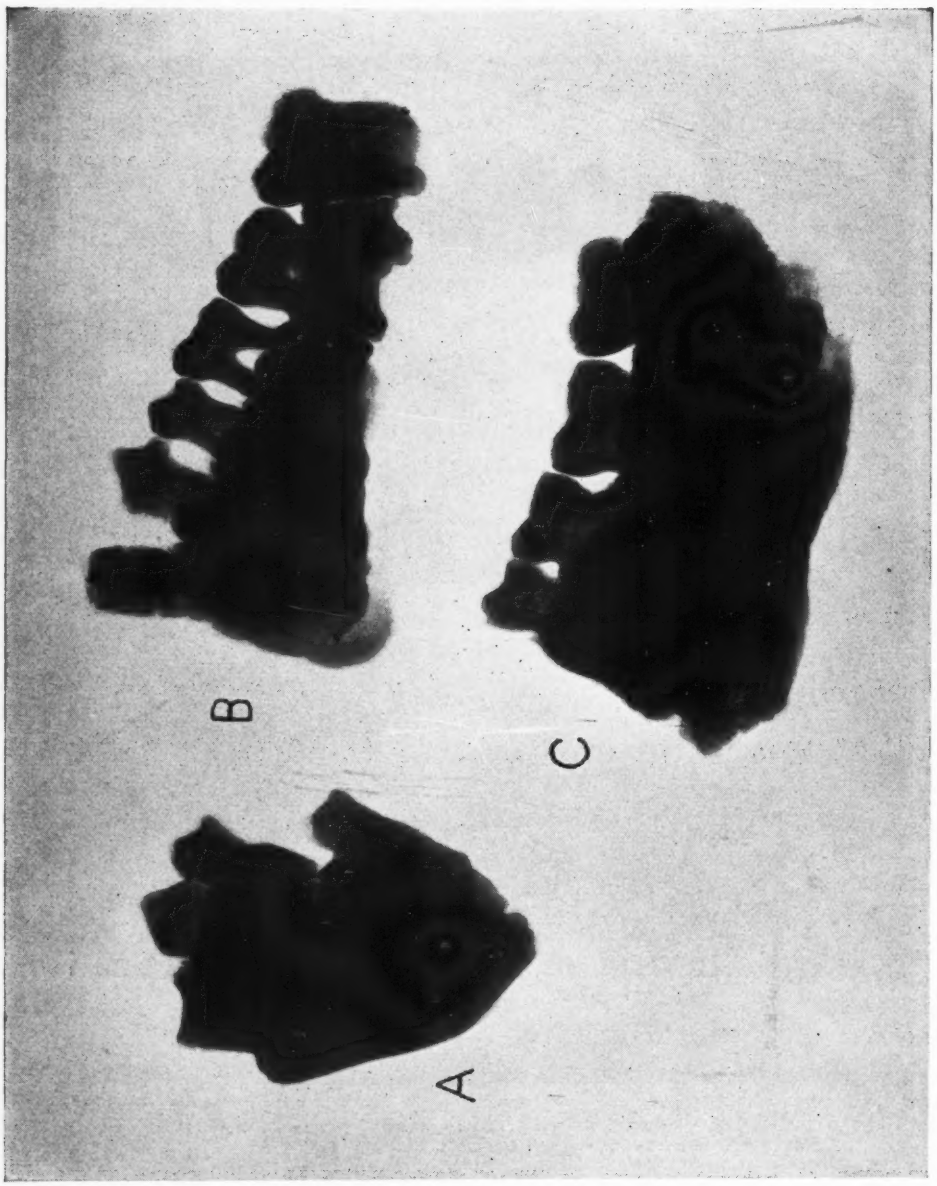


Fig. 11.—Radiographic views of fossil *Dryopithecus*. *A*. Chin region of *Dryopithecus pilgrimi*, Miocene of India. *B. Dryopithecus cautleyi*, Miocene of India. *C. Dryopithecus frickae*, Miocene of India.

A RATIONAL TREATMENT OF INFRAOCCLUSION CASES

By L. B. Higley, B.A., D.D.S., Iowa City, Iowa

LACK of vertical development in the deciduous as well as in the permanent denture has presented a problem in etiology and treatment for many years and still continues to do so. This lack of vertical growth in the deciduous denture denotes in practically all cases a similar condition in the permanent set resulting from the arrested eruption of the first permanent molars due to the mechanical interference brought about by the close or short bite condition of the deciduous teeth and supporting structures. The construction of pleasing artificial dentures, bridges, porcelain jacket crowns, etc., is practically a physical impossibility when this lack of vertical growth persists throughout life. Thus the elimination of the condition in the child is an asset to the patient from the esthetic as well as general health standpoint and to the prosthetist as an aid in the ease of production of satisfactory artificial substitutes.

Dr. Sherman L. Davis, professor of chemistry of the University of Indiana, attributes much of the failure of the normal eruption of the teeth and vertical growth of the supporting structure to a lack of certain dietary factors or to improper assimilation due to endocrine disturbance. This endocrine disturbance results in a deficiency in the hormone produced by the hypofunctioning gland. He claims to have produced growth of bone and eruption of teeth by supplying a proper mineral content (principally a correct calcium-phosphorus ratio) for the blood together with the hormones necessary to cause the blood to utilize these minerals. These hormones are provided by administering tablets of the desiccated endocrine glands which are in hypofunction, generally parathyroid, the hormones being stimulated to activity in turn by the proper intake of vitamines derived from the foodstuffs containing them in greatest abundance. So much for a very brief analysis of the biologic phase of the subject, which is an all important one deserving a paper in itself. After due consideration one cannot doubt that it will be a decisive factor in the ultimate solution of this problem as well as many others dealing with the growth and development which safeguard our mechanical end-results by the natural retention of newly formed supporting structures.

The mechanical treatment of these cases with metal overlays placed over the crowns of the mandibular deciduous molars has been previously described, carefully and in detail by Dr. R. C. Willett of Peoria, Ill., in a paper *Intercepting Certain Types of Malocclusion* read before the Orthodontia Section at the national meeting in August, 1928, and published in the *Journal of the American Dental Association* for March, 1929. The purpose of the remainder of this paper is to present a similar type of treatment differing, however, in that vulcanite has been substituted for the metal of the overlay. The writer

is convinced of its aptitude after a systematic treatment of a number of cases. The following is of value during the retention of the deciduous molars for prevention of a close or short-bite condition.

In our procedure we employ a working cast as well as a record cast, the former being used in the construction of the necessary appliance. The impressions for the working casts are taken with modelling compound, care being used to obtain a good impression of the posterior teeth, especially those of the mandibular denture. This is, as a rule, easily accomplished because we are working with short teeth of the deciduous set with the possible exception of the four permanent maxillary and mandibular anteriors and the partially erupted first permanent molars. If necessary sectional impressions may be taken to avoid any distortion in removal of the compound impressions.

The coronal impressions of the first and second deciduous molars are next packed with amalgam somewhat past the cervical outline rootwise, and a bent wire is imbedded into the amalgam to engage the plaster when the cast is poured. Care must be taken not to let the amalgam extend into the coronal impression of the first permanent molars if it is to receive an amalgam model of this tooth as prepared from an individual impression of the first

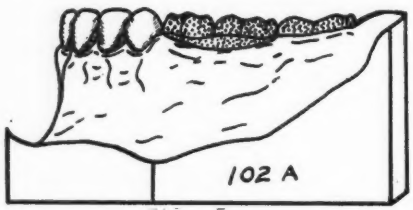


Fig. 1.

permanent molar taken with a copper band and compound. If molar bands are made direct, this precaution is unnecessary.

If individual models of the first permanent molars are used, they are put in position in the impression and luted to place. The impressions are then boxed and poured in plaster or stone as preferred. After separating the casts the mandible appears from the lateral aspect as pictured in Fig. 1. The stippled portion is the first permanent and deciduous molars as seen on one side. A gold saw is now used to cut down between the amalgam first permanent and second deciduous molars, if necessary at the expense of the deciduous crown. This permits adapting of a molar band yet does not destroy any necessary surface for the making of the overlays.

The overlays are of one piece and, with the exception of the proximal surfaces where they thin out at the distal marginal ridge of the second deciduous molar and the mesial marginal ridge of the first deciduous molar, completely cover the crowns of the mandibular first and second deciduous molars and bridge the embrasure between the two. They should extend gingivally to a point slightly above the free margin of the gum on the buccal and lingual, thinning out to a knife edge and following the contour of the crowns accurately.

The amalgam crowns of the deciduous molars are covered with a thin film of oil and inlay wax melted over them and then carved to the exact

or approximate contour depending on whether one desires to finish the wax pattern or the vulcanite itself. Care should be taken to thin out and terminate the overlay at the distal marginal ridge of the second deciduous molar, so as to insure no mechanical interference to the subsequent eruption of the first permanent molar. The wax patterns are then removed from the case, filled with plaster, and seated on a smoothed surface of soft plaster, which fills the lower half of a vulcanizing flask level full. The wax patterns thus appear projecting above the surface of the plaster in the lower half of the flask. Liquid soap is now used as a separating media and the upper half of the flask is poured. After separating and removing the wax, the depressions in the upper half of the flask are filled level full with maroon rubber, the flask is closed and the case vulcanized. A sheet of cellophan may be placed over both sides of the flask before packing and closing to insure smooth surfaces to the overlay. The overlays are trimmed with vulcanite files and polished. The amount that the bite is to be opened by the overlays may be determined by placing them on the mandibular cast and occluding with the maxillary cast, or this may be done directly in the mouth. Fig. 2 shows an overlay in place on the cast as seen from a lateral view. To repeat, the overlays are trimmed quite thin on the buccal and lingual surfaces following the

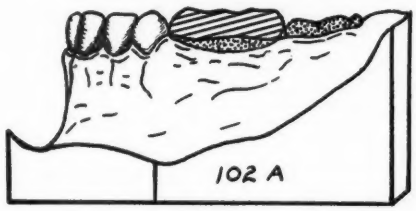


Fig. 2.

contour of the crowns and thinning out to a knife edge slightly above the free margin of the gum. Generally the overlays are left slightly high when first set so they will still be high enough after the opposing teeth have worn grooves into them. Several sets of wax patterns may be carved and vulcanized at the same time but finished for contour and height as needed if the bite is to be opened more from time to time.

The overlays are then tried in the mouth and if satisfactory are cemented to place. In case the overlays loosen, the old cement may be dissolved out by placing them in hydrochloric or sulphuric acid of a strength routinely used for pickling.

Summary of steps in construction of the vulcanite overlays:—

1. Compound impressions of the maxillary and mandibular dentures taken.
2. Mandibular deciduous molars packed with amalgam and pins inserted for incorporation into the plaster cast.
3. Amalgam models for first permanent molars placed in impressions.
4. Impressions boxed, poured and separated.
5. The amalgam deciduous molar crowns oiled and wax melted over them.
6. Wax patterns of overlays carved.
8. Wax patterns flasked.
9. Flask separated, cellophan sheets placed, packed, vulcanized.
10. Vulcanite overlays reduced to proper size.

Advantages of vulcanite over metal:—

1. Several sets may be made at one time for future use.
2. Shock is reduced in biting because of resilience of material.
3. Removal if necessary is easily accomplished.
4. After opening the desired amount, the overlays may be ground away a small amount at a time letting the force of occlusion gradually onto the permanent molars.
5. Providing the first deciduous molars are lost, the overlays may be cut to fit over the second deciduous molars only, for the remainder of the treatment.
6. Cost of production and loss in grinding is greatly reduced.

If forcible eruption of the first permanent molars is desired, finger spring wire may be shaped and imbedded in the wax pattern of the overlay so as to be incorporated in the vulcanite with a free end on the buccal and lingual to be sprung gingivally to hooks on the buccal and lingual of bands placed upon the mandibular permanent molars.

Recently we have treated several cases using hecolite in preference to vulcanite because of its esthetic quality but with less gratifying results.

The writer believes that this mechanical treatment supplemented by a correct adjustment of the biologic factors will go far in eliminating a serious condition confronting orthodontists as well as general practitioners today.

THE TECHNIC OF THE LINGUAL AND LABIAL ARCHES*

By Oren A. Oliver, D.D.S., F.A.C.D., Nashville, Tenn.
Former Professor of Orthodontia at Vanderbilt University

(*Continued from June issue.*)

CONSTRUCTION OF THE LABIAL ARCH

Step 1.—Clamp the model on the Bach soldering block. Place flux on the buccal surface of the band and apply a small quantity of 14 K. solder. A round tube, ¼ inch in length and .040 inch in diameter, is held against the

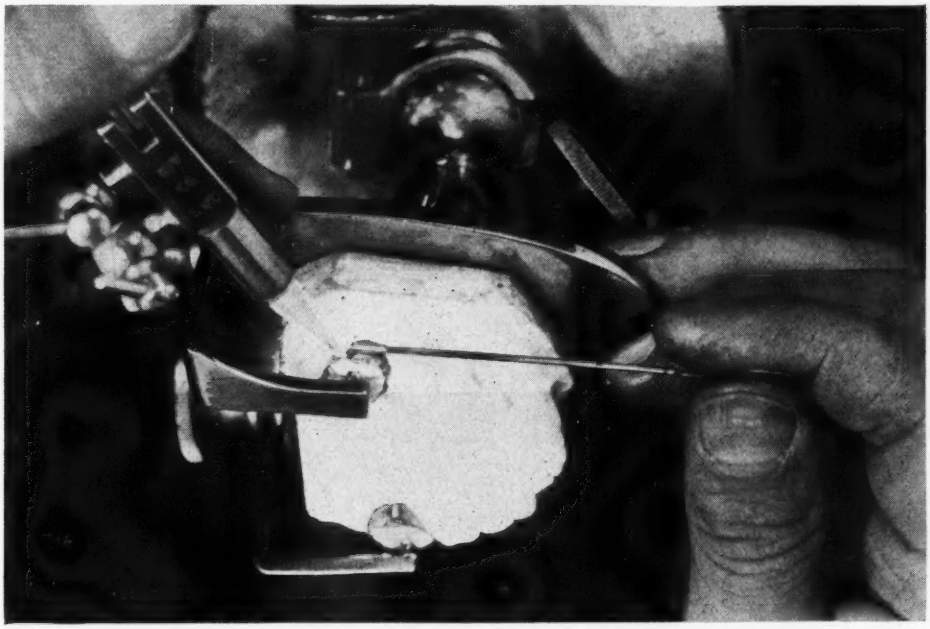


Fig. 59.—Placing the model on Bach soldering block, holding a Deeortho round tube ¼ inch in length, .040 inch inside diameter, holding tube in position with dummy soldering wire and soldering to band with 14K. solder.

band at the angle required for the body wire to lie in the correct position and soldered. An excellent holder for the tube may be made from a short length of German silver wire, tapered so that the tube can be held firmly in position.

A similar tube is attached to the band on the opposite side (Fig. 59).

Step 2.—A length of .040 inch wire is next placed in the tube on the left anchor band, leaving ¼ inch surplus posterior to the tube. Bend the wire carefully around to the opposite band, conforming it to the general outline of the teeth, and clip it posterior to the tube with pliers No. 131. Remove the body wire from the tube and smooth the end with a file. Next, replace the wire in the tube on the left anchor band, and bend it around and place it in the tube on the right anchor band (Fig. 60).

*Read at the Twenty-seventh Meeting of the American Society of Orthodontists, April 30-May 3, 1928, Buffalo, N. Y.

Step 3.—Press the body wire back evenly through the tubes, so that it rests against the anterior teeth. With Oliver tweezers hold it against the wire opposite the lateral incisors, and apply flame in the canine region, first on the

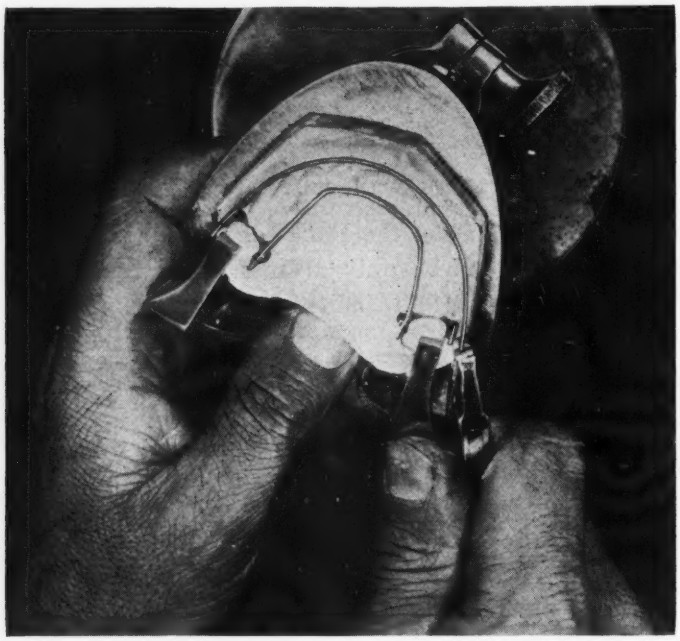


Fig. 60.—Cold bending the labial arch. (A piece of straight Deepep .040 inch wire is inserted through the tube, bent around to the opposite side to the posterior end of the tube, and cut off with S.S.W. pliers No. 131.)

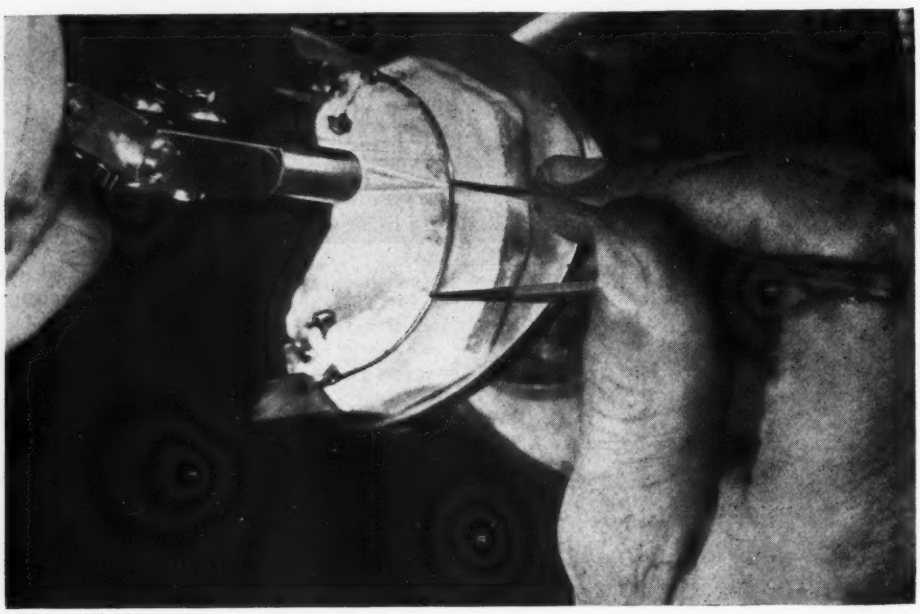


Fig. 61.—Holding the .040 inch wire with the Oliver special pliers and rendering wire passive with heat.

right side and then on the left. Next, carry the flame to the anterior surface between the canines and then to that part of arch between the canine and the tube on either side (Fig. 61).

Step 4.—Make a mark on the labial surface of the body wire ¼ inch anterior to the round tube on one side only (Fig. 62).

Step 5.—Remove the body wire from the tubes, and place flux and solder on the gingival surface exactly opposite the mark on the labial surface; then solder the 0.022 inch wire (Fig. 63).

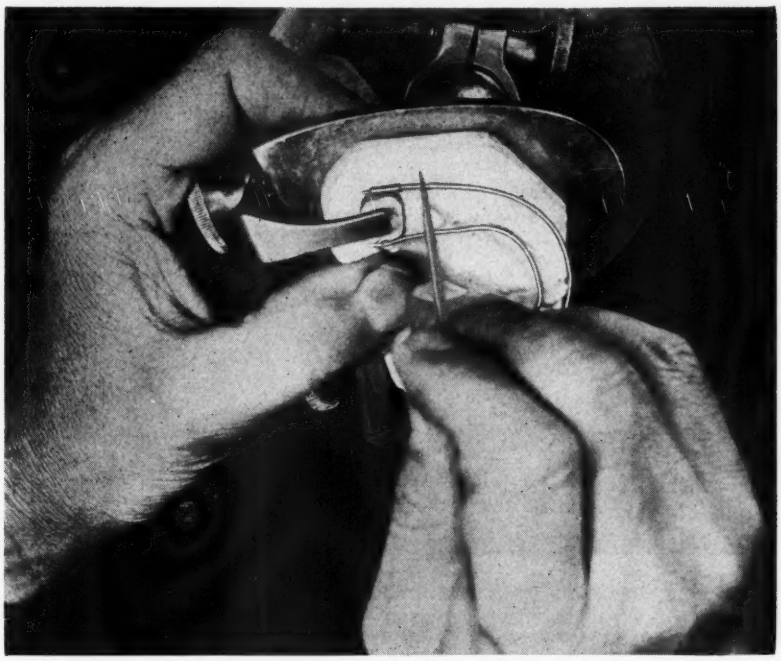


Fig. 62.—Marking the labial arch anteriorly to the round tube for the stop spring.

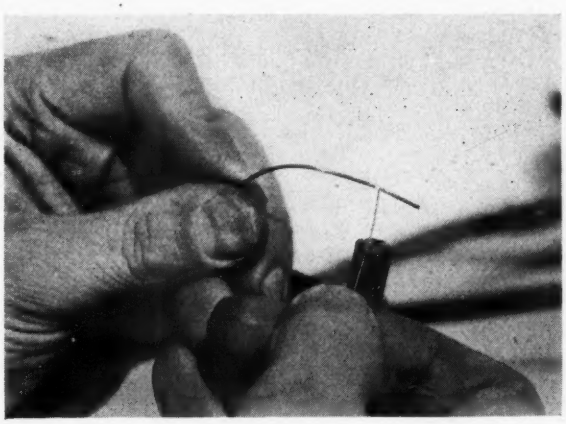


Fig. 63.—Soldering the end of a piece of 0.022 inch wire at right angles to the labial arch about 3 mm. in front of the buccal tube.

Step 6.—Grasp the 0.022 inch wire where it joins the body wire between the beaks of pliers No. 329. Using the left hand, bend the wire posteriorly around the beak of pliers (Fig. 64), and around the body wire with the free end of the 0.022 inch wire toward the operator (Fig. 65).

Step 7.—Clip the wire with pliers No. 131 where the loop is completed (Fig. 66).

Step 8.—Grasp the 0.022 inch wire with pliers No. 142, and bend it around the body wire, making the 0.022 inch wire loop around the arch wire (Fig. 67). Place the body wire back in the tubes, make a mark on the opposite side ¼

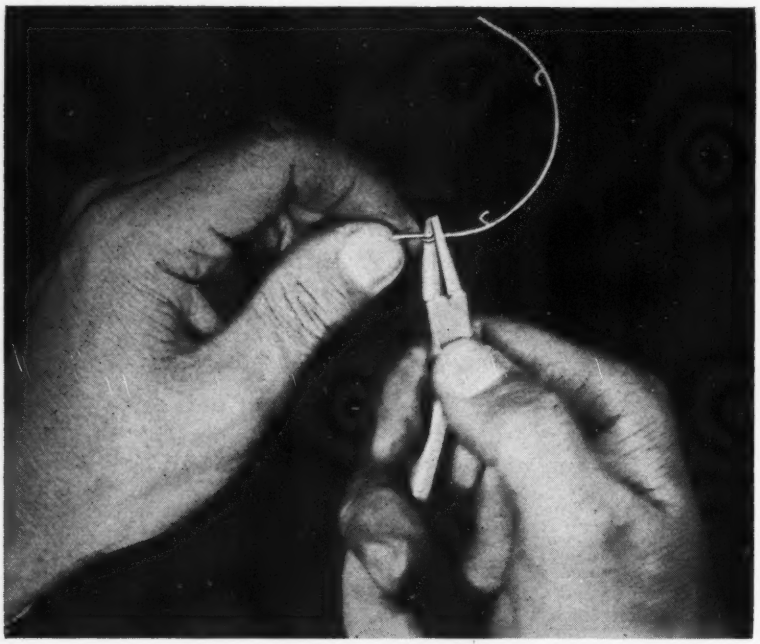


Fig. 64.—Wrapping the 0.022 inch wire around the end of nosed pliers S.S.W. No. 329.

Fig. 65.—Wrapping the 0.022 inch wire around the labial arch for contact with anterior end of tube.

inch anterior to the tube, and make a similar lock on this side. Bend also the body wire as has been previously described, and place it in the tubes with the posterior parts of springs against the tubes. Hold it in position with large pins

while heat is applied, first to the anterior part and then around the tubes on either side. Remove the body wire and make minor adjustments so as to conform to the labial surface of the teeth.

Fig. 66.—Cutting off the 0.022 inch wire at a point so that it completely encircles the labial arch.

Fig. 67.—Closing the loop around the .040 inch wire with S.S.W. pliers No. 142.

CONSTRUCTION OF THE INTERMAXILLARY HOOKS

Step 1.—Place flux and 14 K. solder on the labial arch opposite the canine. Take a length of 0.035 inch wire and solder it at right angles to the labial arch opposite the canine (Fig. 68).

Step 2.—Solder a similar wire on the opposite side at the same position. Remove the arch, and grasp the 0.035 inch wire at the required length, which

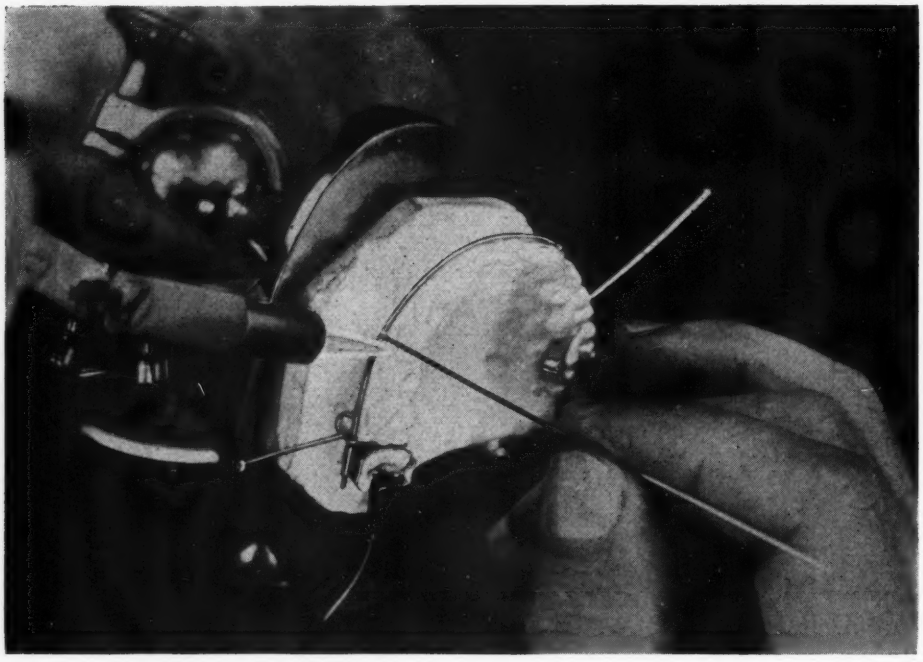


Fig. 68.—Soldering an 0.035 inch wire at right angles to the labial arch for intermaxillary hook.

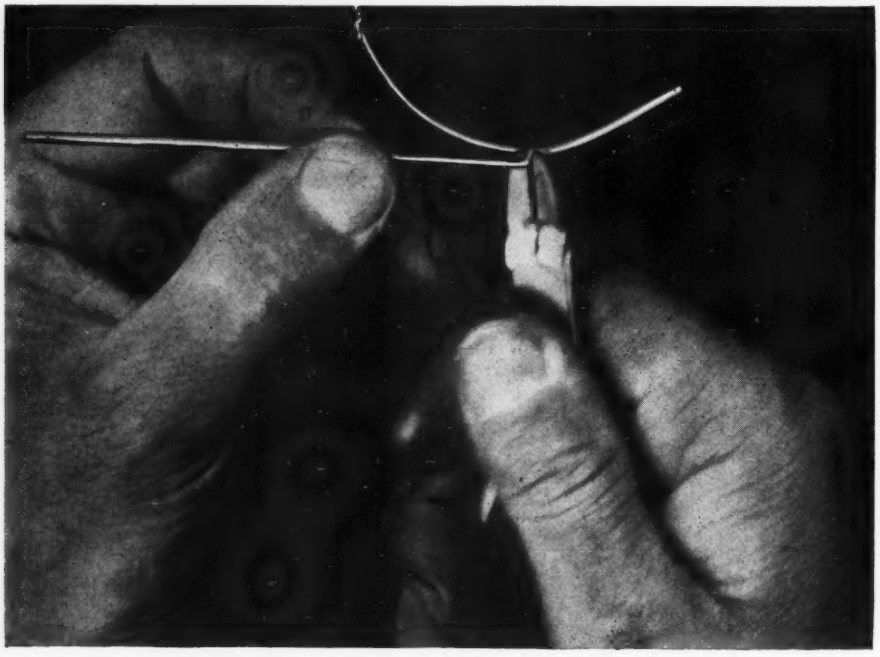


Fig. 69.—Bending the intermaxillary hook the desired length with S.S.W. pliers No. 142.

usually extends to the occlusal surface. Take the long end of the 0.035 inch wire in the left hand and bend it at a right angle anteriorly (Fig. 69).

Step 3.—Clip the long end of the wire with pliers No. 131 about ¼ inch in front of the right angle bend (Fig. 70).

Step 4.—Hold the wire in a flame, and ball the end so that it will not irritate the tissue (Fig. 71).

Fig. 70.—Cutting off the 0.035 inch wire at the desired length for the intermaxillary hook with S.S.W. pliers No. 131.

Fig. 71.—Rounding the end of the intermaxillary hook.

Step 5.—Grasp the body wire with pliers No. 142 within the loop; and with the free hand bend the body wire anterior to the loop so that the arch will be just above the gingival margin (Fig. 72).

Fig. 72.—With S.S.W. pliers No. 142, bend the labial arch upward in front of the buccal tube to reach a high labial or modified labial position.

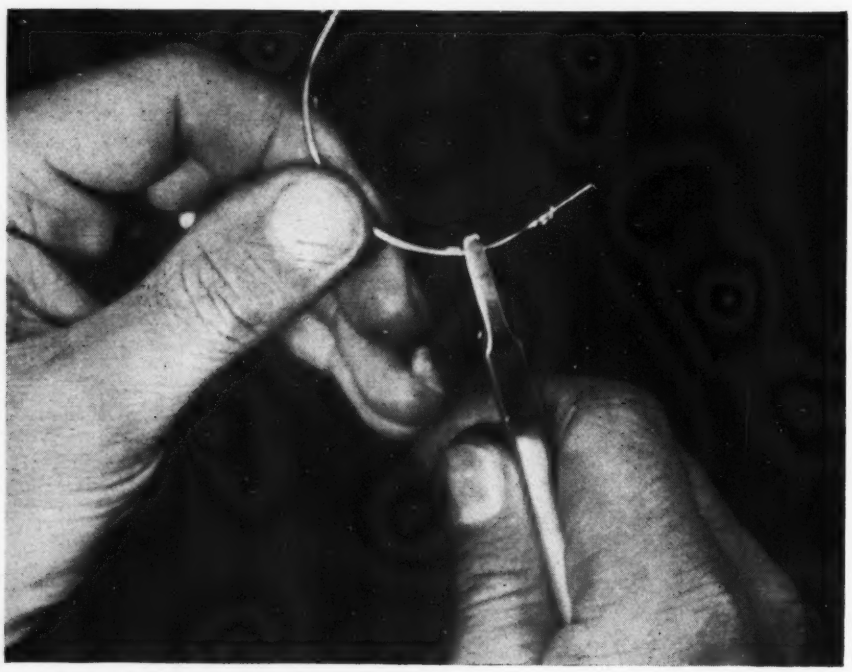


Fig. 73.—Bending the labial segment of the arch incisively at the canine region with S.S.W. pliers No. 120.

Step 6.—Make a second bend by grasping the labial arch with pliers No. 120 opposite the canine and bending the anterior part of the body wire occlusally (Fig. 73).

The complete labial arch in position is shown in Fig. 74.

SOLDERING THE INTERMAXILLARY HOOKS ON THE BANDS OF THE MANDIBULAR MODEL

Step 1.—Take a length of 0.035 inch wire, and holding it between the index finger and the thumb of the left hand, flatten the end with pliers No. 142 and bend it slightly away from the operator (Fig. 75).

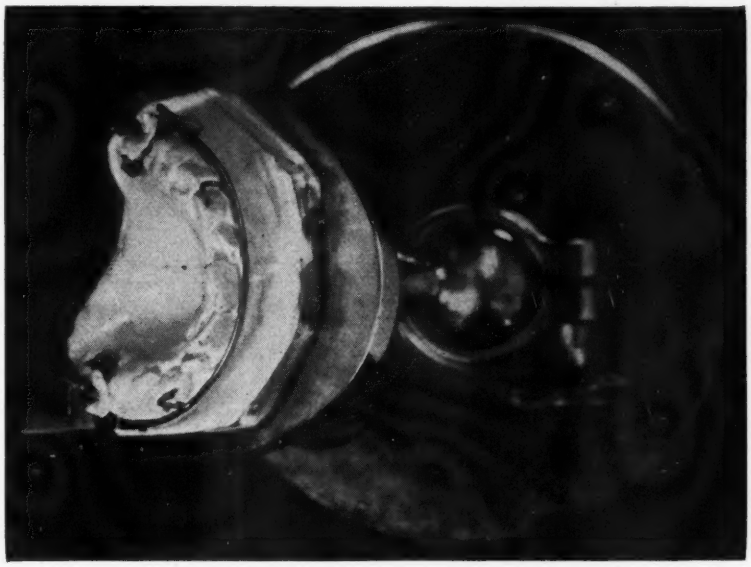


Fig. 74.—The completed labial arch.

Fig. 75.—Flattening and bending at a slight angle on 0.035 inch wire with S.S.W. pliers No. 142, for attachment to the maxillary band for intermaxillary hook.

Step 2.—Place the model on the Bach solder block, and place flux and solder on the buccal surface of the band. Hold the 0.035 inch wire with the flattened end against the band and unite the two in a flame (Fig. 76).

Step 3.—Clip the wire at the desired length with pliers No. 131. Holding the model between the index finger and the thumb of the left hand, place the flame on the posterior end of the wire and ball it (Fig. 77).

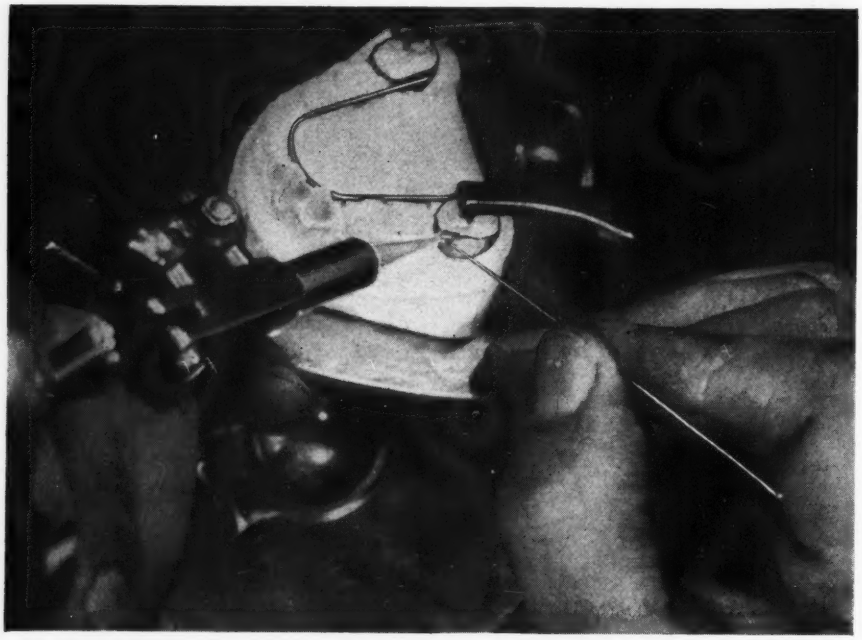


Fig. 76.—Soldering the 0.035 inch wire to the band.

Fig. 77.—Rounding the end of the 0.035 inch wire.

Step 4.—Holding the model between the index finger and the thumb of the left hand, place one beak of pliers No. 329 between the soldered wire and the band, with the other beak resting on the outer surface of the wire, and bend in and around the beak toward the posterior surface (Fig. 78).

Fig. 79 shows the intermaxillary hooks soldered on the mandibular bands.

AUXILIARY SPRINGS

Finally, I wish to describe briefly the types of auxiliary springs most frequently used and to give the purpose for which each is designed. Of course, it should be remembered that more than one type of spring can be used on the same arch.

They are so numerous that it is difficult to present my method of treatment without some identifying name for each type, and I have therefore named them to facilitate their differentiation.

Fig. 78.—Bending the 0.035 inch wire with S.S.W. pliers No. 329.

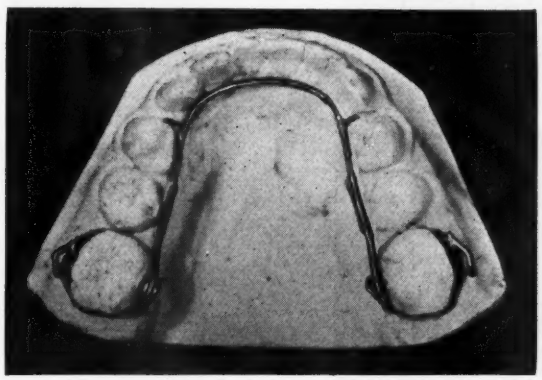


Fig. 79.—The completed intermaxillary hook.

Fig. 80 is a lingual arch with a stabilizer on either side. These stabilizers are used to hold the auxiliary springs in their proper position and to protect the spring from being misplaced. These stabilizers may be placed at any position where they are indicated.

Fig. 81 shows a lingual arch with simple springs attached in three different positions.

Fig. 82 shows a compound lingual spring attached to the lingual arch.

Fig. 83 is a compound return spring which may be attached to either side or in the anterior portion.

Fig. 84 is a recurved simple spring which is usually attached between the first and second premolars and extends only up to the canine. This spring is generally used for expansion in the canine and the premolar regions.

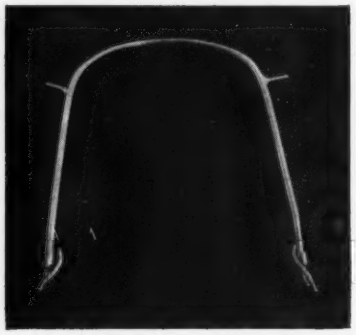


Fig. 80.—The lingual arch with stabilizers.

Fig. 81.—Simple lingual spring.

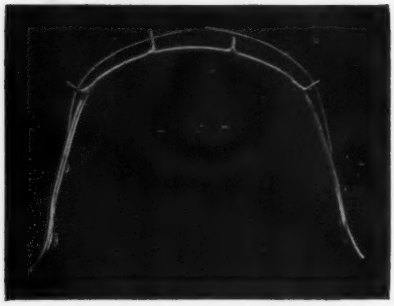


Fig. 82.—Compound lingual spring.

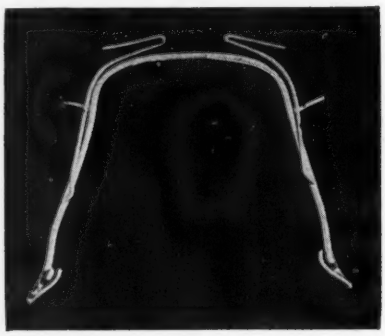


Fig. 83.—Compound return spring.

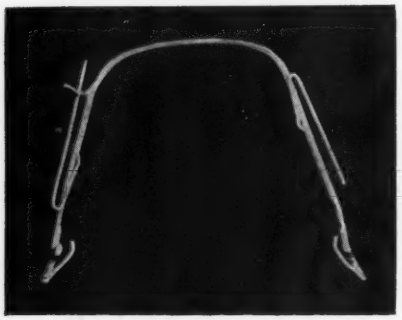


Fig. 84.—Simple recurved spring.

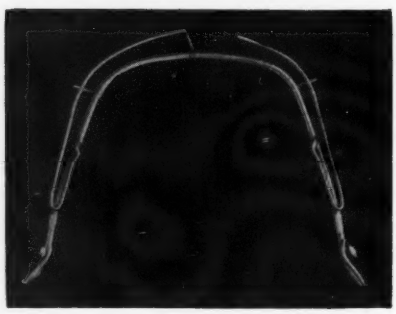


Fig. 85.—Compound recurved spring.

Fig. 85 is a recurved compound spring which is usually attached between the premolars and carried around to the anterior portion to exert pressure on the premolars, canine, and incisor.

Fig. 86 is a recurved compound return spring, used for expansion in the canine and the premolar regions, and for moving the lateral incisors anteriorly.

Fig. 87 is a loop spring which is very valuable in closing up space or making space and can be used either on the occlusal or the gingival portion of the lingual arch.

Fig. 88 shows the loop coil spring, which is very good because it cannot be easily displaced, as it is looped around the lingual arch. This spring is used for closing space between teeth or for making space.

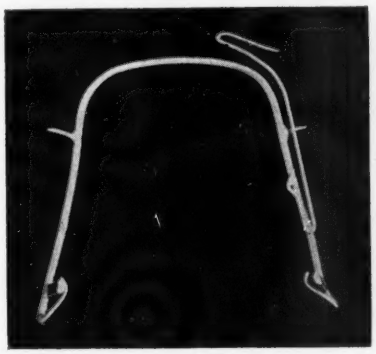


Fig. 86.—Compound recurved return spring.

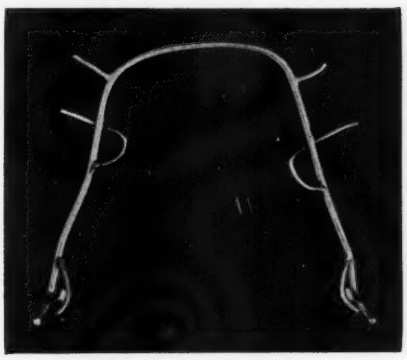


Fig. 87.—Loop spring.

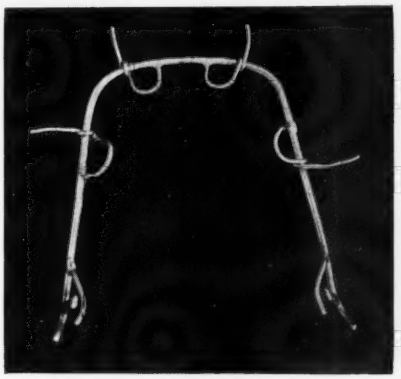


Fig. 88.—Coil loop spring.

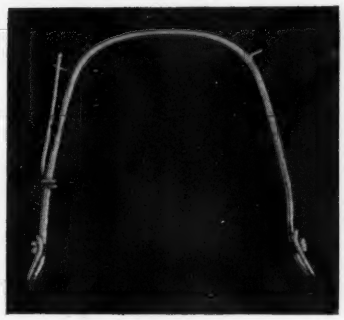


Fig. 89.—Simple spring, wrapped attachment.

Fig. 90.—Compound spring, wrapped attachment.

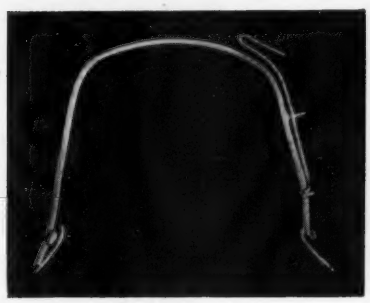


Fig. 91.—Compound return spring, wrapped attachment.

Fig. 89 shows a simple spring with a wrapped attachment. There is a little more tensile strength in the wire when it is wrapped around the lingual arch.

Fig. 90 is a compound spring with a wrapped attachment.

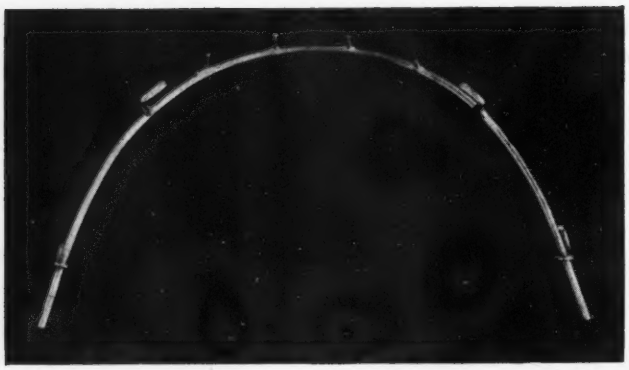


Fig. 92.—Simple labial spring.

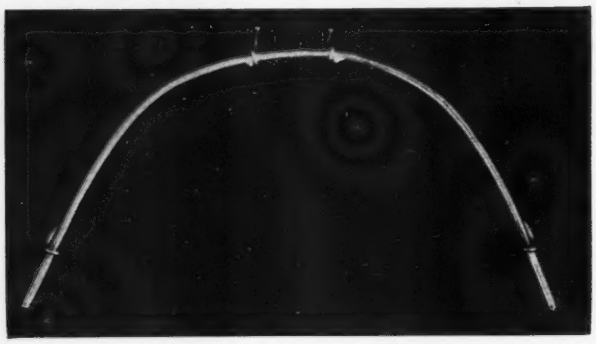


Fig. 93.—Simple labial coil spring.

Fig. 94.—Labial spring, ringed for ligature.

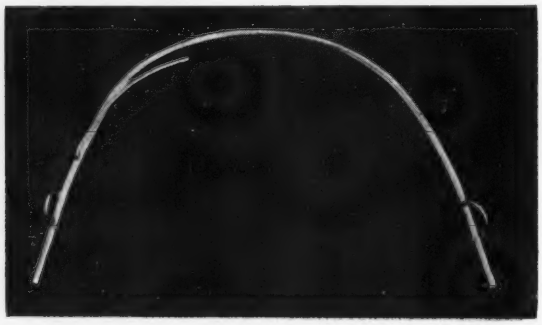


Fig. 95.—Simple labial curved spring.

Fig. 96.—Right angle labial spring.

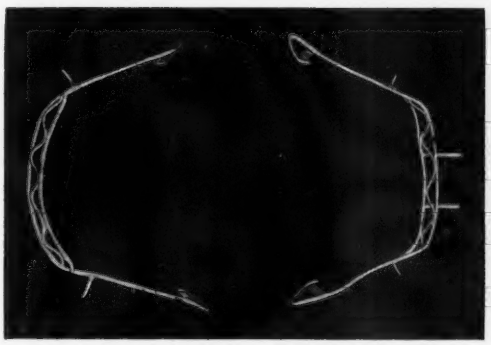


Fig. 97.—Posterior extension spring.

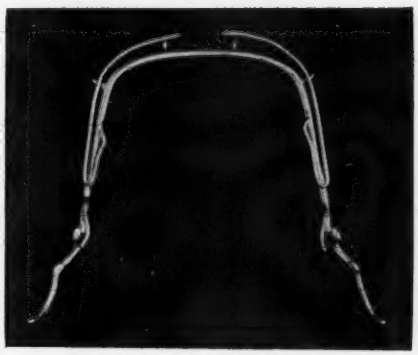


Fig. 98.—Bite plane appliance.

Fig. 99.—U-type labial tube spring.

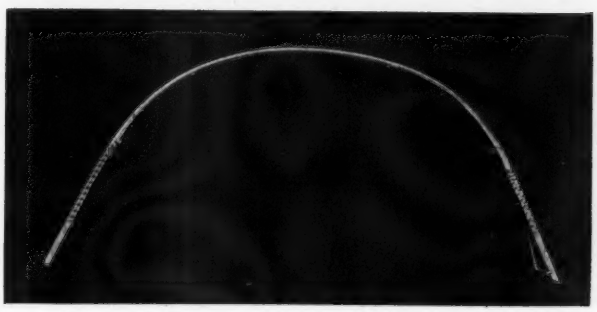


Fig. 100.—Coil-type tube spring.

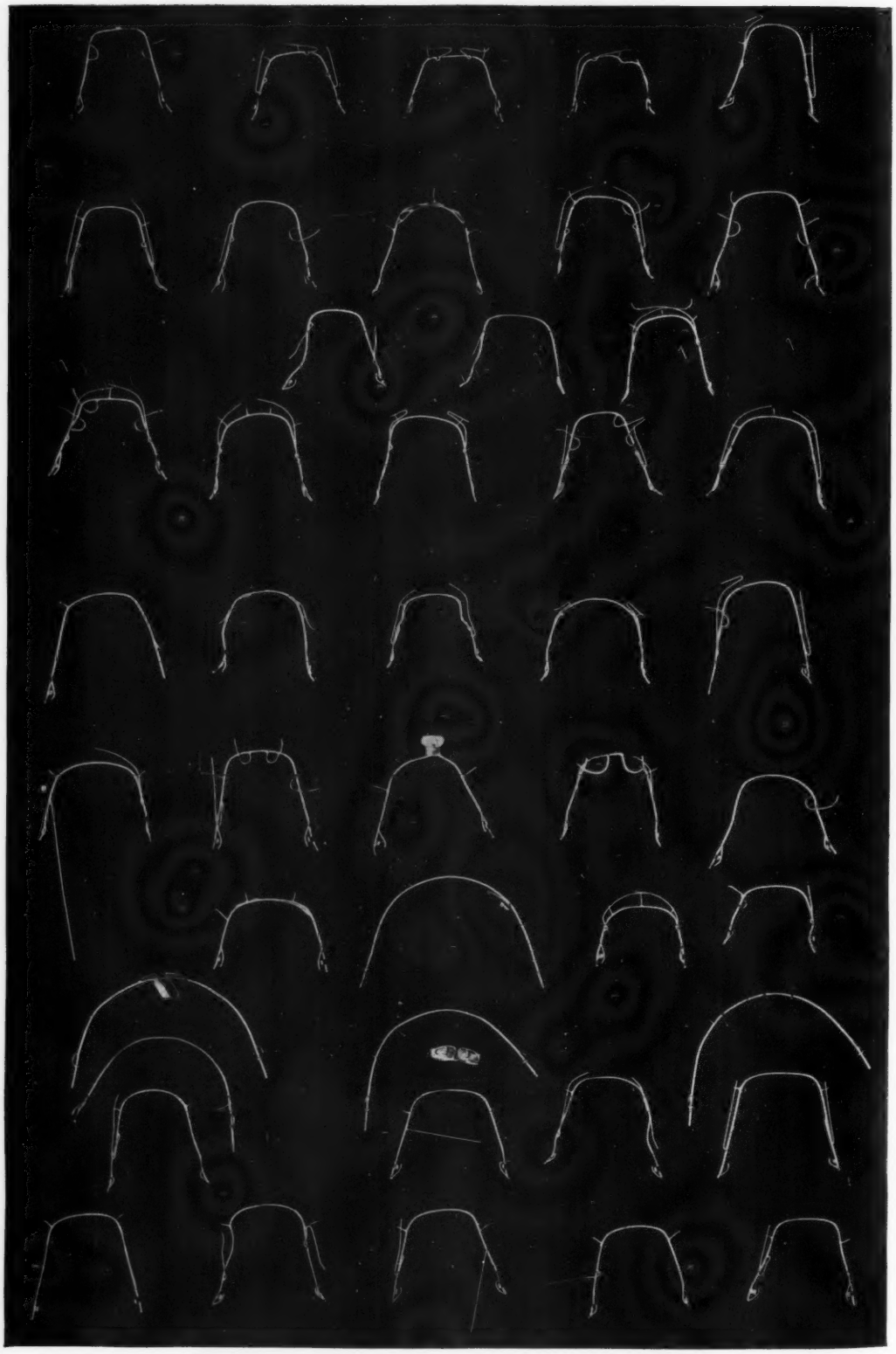


Fig. 101.—Combination of various types of auxiliary springs used on actual cases.

Fig. 91 is a compound return spring with a wrapped attachment.

Fig. 92 shows simple labial springs which are attached to the labial arches for movement in the incisor region. This type of spring may be used on high labial or medium high labial arches and can be used in conjunction with teeth banded and an 0.022 inch tube on the band for rotating teeth.

Fig. 93 is a simple coil labial spring, used for practically the same purpose as the simple labial spring, but because of the fact that the spring wire is coiled around the labial arch there is more tensile strength in the wire.

Fig. 94 shows labial springs with rings for ligating the teeth to the springs. The ringed end of the spring keeps the ligature from slipping up or down.

Fig. 95 is a simple, curved, labial spring, usually attached about the second premolar, and it used for the purpose of carrying the canines downward and posteriorly.

Fig. 96 is a right angle labial spring which is usually attached near the second premolar on the labial arch. This spring is used to carry the canine lingually.

Fig. 97 shows posterior extension springs, which are of great value as a great many second molars are not in normal positions; therefore, it becomes necessary to use some type of attachment which will move them lingually or buccally. This spring is also valuable where it becomes necessary to have a more stable anchorage, as it can be extended to the second molar.

Fig. 98 shows the bite plane which I have found excellent in the correction of posterior occlusion and closed bite cases.

Fig. 99 is the U-type labial spring which is used anterior to the buccal tube.

Fig. 100 is the coil-type tube spring which is used anterior to the buccal tube and may be used for carrying the incisors either anteriorly or posteriorly.

Fig. 101 shows the various types of springs used in the treatment of various types of cases.

DISCUSSION

President Childs.—I wish to state in introducing our next speaker that in view of the fact that a great many of our members were not present at the meeting at Buffalo last year when Dr. Oliver presented the complete "Technic of the Lingual Arch Construction," we requested him to complete this paper. Dr. Oliver needs no introduction to this audience, so it gives me great pleasure at this time to call on Dr. Oren A. Oliver who will address us on "The Technic of Lingual Arch Construction." Dr. Oliver! (Applause.)

President Childs.—I know we all appreciate this valuable contribution from Dr. Oliver. The discussion will be opened by Dr. Harry Kelsey of Baltimore.

Dr. Harry E. Kelsey.—I have very little to say, Mr. President. I am in the enviable position of having a perfect alibi for not offering a long discussion of this paper, as I waited in vain for a copy of it. It might be argued that Dr. Oliver's technic and principles should be so well known to anyone in the profession that he wouldn't need a copy of his paper to discuss it. However, I shall be brief.

I was particularly pleased with the history that Dr. Oliver gave of the development of the lingual arch, and so far as I know it is very accurate, fair and just. I have always thought that Dr. Lourie did a great thing for the profession when he first developed and used the lingual arch. No matter what the form, it was nevertheless the principle that he applied to orthodontic technic, and the improvements and modifications that have come after and have made it so much more valuable were just as great a contribution by those who made them. I think the history, as Dr. Oliver gave it, is perfectly fair and just.

Dr. Mershon certainly did take the Young-Angle lock as a lingual attachment for the lingual arch and make the lingual arch a practical instrument for the entire profession to use in a practical manner. The fixed lingual arch could be worked by Dr. Lourie and possibly a few others who had mastered the technic, but it was not practical for the rank and file of operators. But the lingual arch, combined with the Young-Angle lock which made it removable, became a practical orthodontic instrument and one of the most valuable that we have ever had. I say the Young-Angle lock because I think history will show that vertical tube was a development by Dr. Angle and Dr. Young for use with the original pin and tube appliance. I very well remember Dr. Angle showing the tube, a small vertical tube, which he inclined very much forward and said that if sufficiently inclined forward would not require a lock. He and Dr. Young developed that attachment, so far as I know, and I think I am perfectly correct in that.

Dr. Mershon had an inspiration after using it for years on the buccal arch wire when he adapted it then to the lingual arch wire, and in his hands and the hands of such men as Dr. Oliver and others who had added to the technic it has become one of the most valuable instruments that the orthodontist possesses today. Certainly no man has added any more to its usefulness, I personally think, than has Dr. Oliver. This exposition of the technic is something that I believe can be carefully studied by a man who has never used the lingual arch, carefully studied step by step, paying attention to the degree of angle which is given for bends and so forth; and I believe such a man could actually work out his technic in conformance with the rules given by Dr. Oliver. It can greatly improve the technic of one who has been using the lingual arch, and he will readily understand Dr. Oliver's text. Many men will develop personal variations in technic from this, but fundamentally, I believe, it cannot be improved upon.

I, personally, like to have a very good technician who is with me in my laboratory make my bands on the teeth on carefully carved models, and in some instances I have to enlarge or diminish the circumference of the band when I put it in the mouth. There is such a large percentage that I don't have to touch, that I feel it saves me a great deal of time over making every band myself in the mouth.

There is one other little point that I want to speak of. I have demonstrated them in clinics and described them for publication, a rectangular tube and a rectangular post, and a different lock from the one that Dr. Oliver has described here, which while much the same (practically the same in principle) in my hands have proved more satisfactory. I use the rectangular tubing and post because it gives on the distal and mesial surfaces a much broader contact than the knife-edge of the half-round tube and half-round post, and it does not work loose and rock as easily in my hands as did the half-round tube, and that was the reason I used it. Furthermore. I saw very many ways of applying the lock demonstrated by different men, and some of these suggested to my mind that modification which I use and prefer, which is to fasten immediately in front of the vertical tube a little lug which extends forward from the tube and under which my lock wire is bent, instead of bending it under the cervical end of the tube to lock the post into position. In that way I avoid pressing my lock wire into the cervical gum tissue; the tube can be full length and touch the gum tissue without impinging on it, and then the lock wire will not require further space and make it necessary to force it under the gum tissue. It is just as easy; the soldering on of the little lug does not take a moment, and I believe that it is much more secure. I always use a soft wire that can be bent under, and it can be removed perhaps eight or ten times before a new one has to be put on. I use this in preference to a spring wire.

I quite agree with Dr. Oliver that the lock wire should be attached in front of instead of behind the vertical tube. Not only does it, I believe, prevent some breakage, but also, as he says the engineer told him, it does stabilize the arch because it tends, in principle, at least, to pull down and hold down the anterior portion of the arch. While placed posterior to the tube and attached to the end of the arch which is posterior to the tube, the tendency is to pull down the posterior end and to raise the anterior or arch portion of the instrument.

Those things are worth considering.

After all, these slight modifications do not make very much difference. When one learns to use a thing and has acquired a definite technic which is satisfactory to one, I think perhaps one is better off to stick to it. Nevertheless I do feel that the lock and post and tube which I use is, at least in my hands, vastly more secure and satisfactory, and I think if anyone were to try it for three or four months with a dozen different cases, he would like it for the reasons which I gave.

The buccal tube which Dr. Oliver uses is perfectly good for all cases in which a round tube is suitable. I, personally (as I have before stated in clinics which I believe have been published), prefer a square tube, square inside and square outside with rounded edges, because it is not irritating to the buccal tissue and it permits you to use a 0.036 round arch in it which will resolve readily or a 0.036 square arch which makes a stationary anchorage. So that in my practice, except where some greater strength is required, some larger gauges of arch may be necessary, except in very occasional special cases I have no buccal tubing except the 0.036 square arch which I have just described and which I can use for a round arch or I can use with a square end for stationary anchorage. If I want to use that same tubing with a 0.038 arch, for instance, it is very easy to take a little instrument and ream it out slightly so that the 0.038 round arch will roll into it.

In conclusion I want to say that I probably wouldn't have talked as long even if I had had Dr. Oliver's paper to study, because I think it is more or less a waste of time for anyone else to get up and go through a long discussion of a subject which has been treated in the manner in which Dr. Oliver has treated this. His treatment of it is the result of years and years of the most painstaking and laborious attention to details and is not only the result of study but also the result of a wide experience in which he has been honestly endeavoring to work out the best technic not only for himself but also for the benefit of his patients and for the benefit of the profession, and I think we are indebted to Dr. Oliver for the immense amount of work he has done along these lines and has so freely given to the profession. Thank you very much. (Applause.)

President Childs.—The paper is now open for general discussion.

Dr. C. A. Hawley.—Mr. President, I want to commend all that Dr. Kelsey has said with regard to Dr. Oliver, and as the time is short I won't repeat it.

There are two points in this technic that I think could be included, and I want to speak about them. I never would attempt to bend a 0.007 wire around a tube in the mouth. It isn't necessary. I take a thin piece of copper about 10 inches long and about 0.003 thick. It is similar to the copper wire that is made by one of the dental firms for measuring crown teeth; that is too thick but this should be thin. I run this thin piece of copper wire down to a very thin dimension, and I can pass it around the tooth without any difficulty; then flex that and cut the band wire. It seemed to me that it is very questionable to attempt to fit such a thick wire as a 0.007 wire around a tube.

The other point is the attempt to use the half-round wire or to use the square wire which Dr. Kelsey spoke of and which I would recommend on account of the feature which he spoke of, soldering this to the base wire. The essayist suggests that you flatten the end of the wire and put a little piece of solder on the end of the half-round wire. That makes a round surface which is difficult to hold into the wire; and if it is turned either way, you are not straightening it. If you flatten this half-round square wire, put it in a little hand-vise so you can bevel the edges with that hand-vise; then take a little three-quarter file and groove the end of the wire, it can be very quickly done and you can make a groove on it, your file being guided by the jaws of your little vise. Put a small amount of solder on the base wire. When you hold your half-round wire against it, it has a fixed position; it doesn't roll either way, and it doesn't slip off. If you are particularly nervous on any day and things are going wrong, then use a little antiflux on the wire so that it doesn't run down the end.

In these two points I differ with the technic. Otherwise I think it is splendid.

Dr. Martin A. Dewey.—Mr. Chairman, I wish to compliment Dr. Oliver on his excellent technic. There is one thing which you might remember in regard to auxiliary springs. Those of you who have made auxiliary springs with a hairpin band when you want a

safety pin function will probably find you will have less breakage if you put a little safety pin in it. It will decrease the breakage at least 75 per cent.

In regard to the fact of Dr. Angle being the first to use the vertical tube, I believe Dr. Oliver is in error in his statement of that fact, because if you go back to Dr. Jackson's book you will find that he used vertical tubes. You will also find that Dr. Ainsworth used the vertical tube years before the Angle tubes were brought out.

Dr. Harry E. Kelsey.—Dr. Dewey is right. I did not mean to give the impression that that was the first time the vertical tube was brought out. Dr. Dewey is right in his statement as to Dr. Jackson mentioning it in his book, and I saw Dr. Ainsworth exhibit appliances with a round vertical tube. It wasn't half-round, but the principle was there it is perfectly true.

Dr. N. C. Leonard.—There is just one little point in reference to the soldering of the post to the body wire. Dr. Porter of New York, made a point that has been very valuable to me. Instead of soldering the end to the body wire, solder it to each side; let the body wire then be toward the cheek; if it is a lingual appliance, let it be toward the tooth instead of toward the lingual surface. That would more than double the strength of the attachment, and there would not be any disadvantage to attaching it that way; it is very simple, and it is very much easier to solder it that way. It will eliminate this notching which Dr. Hawley has just spoken of, and it does make it immensely stronger. I have had from time to time a great many accidents from the breaking of those posts from the body wire.

Dr. Henry C. Ferris.—I wish to commend Dr. Oliver for a beautiful technic and presentation of this subject. The only thing that I would like to speak of is the lock. Dr. Murlless, as doubtless you may be familiar with, has used it to great advantage and reduced a great deal of the cumulative surface for foods and made it particularly secure by cutting through the tube slightly into the pin. That makes the strongest lock that I have ever used, preventing lateral or up and down movements, particularly for children who have a tendency to tongue habit, and lifting the arch in the anterior region.

Dr. J. A. McPhail.—I would like to ask Dr. Oliver if he puts a ball on the end of his auxiliary spring, how does he prevent taking the temper out of the auxiliary spring and what kind of wire does he use.

I would like to make the comment, Dr. Oliver, that you used premolars all the way through your paper instead of premolars and bicuspids. We are all so indebted to Dr. Oliver that I hesitate to offer this correction.

Dr. Jos. D. Eby.—We have just listened to a very masterly paper. The exceptionally high standard and consistency in Dr. Oliver's presentation is the result of his natural aptitude and that degree of perfection which comes through long experience. Dr. Oliver has qualified for such a position through the faithfulness with which he has followed the examples which he has believed to be true and accepted them as the very best course he could pursue in the practice of orthodontia.

Lest we forget, may it be stated just here that at best an orthodontic appliance is a mechanical means to render assistance to nature as a therapeutic measure and should follow the dictation of sound reasoning.

Mention should be made of the great care with which this paper has been prepared and presented with these 101 illustrations so beautifully arranged. Every step in the technic of direct bands, lingual arch, and auxiliary spring construction has been presented with apt description. Dr. Oliver has shown the same care in this which he observes in every appliance he makes.

I recall an expression that has lingered in my memory since boyhood, which is to the effect that one of the secrets of success is devotion to detail. The moral lesson which we can learn from Dr. Oliver's paper, and one that should be very stimulating, is that we should return to our work determined to be more devoted to the minor details in the technic of appliance construction. Another way to express the same thought, is that we should increase in ourselves the sense of fear lest we should fail for the want of appreciation of the finer details which accompany successful efforts.

No treatment of malocclusion can be successfully accomplished unless it is first indicated. To determine the need of treatment is the first necessity, and its thoughtful execution by well-designed appliances is the means to the desired end.

By reason of the plan which Dr. Oliver carried out for the illustration of his paper, it was impractical, and justly so in this instance, for me to go over it before the meeting or in time to prepare a written discussion. All I could do in this short interval would be to touch what seem to me to be a few important points.

In the early part of his paper Dr. Oliver reviews the history of the lingual arch and extends the credit for its origin properly to Dr. Mershon. In so doing Dr. Oliver reveals a most interesting observation in the growth and development of the science and practice of orthodontia. Having emanated from mechanics, orthodontia evolved through decades of empirical treatment. The process of evolution has moved slowly until the present time. As interesting as evolution always is, it required a long succession of events to prepare Dr. Mershon for the careful consummation of thoughts which produced his work in the lingual arch.

The lingual and labial arches with their auxiliary attachments are nothing more to Dr. Mershon than the end-result and evolution of a process of thought which includes all the fundamental knowledge of the vital laws concerning the teeth and the tissues of the face. Dr. Mershon for once in history at least, allowed his ideas of appliances to be dictated in character and design by the specifications offered by facts.

One unusual feature of this is a comparison with the fact that most appliances are propounded out of spectacular mechanical genius and a lot of confounded ideas. We find ourselves today with Dr. Mershon's work grown into our lives, and it is impossible to compute the value of his great benefaction to orthodontia and to humanity.

Thanks to his early opportunities, Dr. Oliver has attacked the Mershon type of appliance with such interest and skill as to have established a practical pattern of technic. The first thought that Dr. Oliver endeavors to uncover is the proposition of the molar anchor band. Dr. Oliver lays down the law as to the specifications of molar bands, and alas, comparatively few orthodontists live up to them. Molar bands should sit sufficiently well cervically to be slightly beneath the free margins of the gums and not impinge upon the soft tissues. With this they should be as wide as possible to not involve contact in occlusion. Aside from this they should possess stability and at the same time the ability to conform themselves to the variations in the forms of teeth from one surface to another.

While many of us believe that the best results can be made by direct fitting of bands to molars, that is not definitely the point. Whether they are made by a totally indirect method, direct method, or any of the many modifications, the end-result should be the same, or the method is not right. In my opinion a man who is careless about an anchor band never fools anybody but himself. The technic of construction of lingual and labial arches and their ultimate success are so dependent upon the proper location of the tubes soldered to the bands, that this point, as Dr. Oliver beautifully describes, is serious and important. Aside from the very fine and generally accepted technic I believe that Dr. Oliver has gone as far as possible to make a would-be hard task simple for himself and others by an unusual manual of dexterity in the use of his hands. Throughout all of his work you will generally find his hands to be in the most natural positions to accomplish in the simplest and most accurate manner the thing he is striving to do. I think a study of Dr. Oliver's hand positions is the masterpiece of this most valuable paper.

Care must always be taken of the location of the lingual and labial arches. They may be too high or too low, thus seriously interfering with the location of the auxiliary springs. Dr. Mershon insists that the ideal appliance must possess sufficient flexibility to allow individual independence to the teeth in movement and function. For this reason Dr. Mershon is disposed against the soldering of any unnecessary horizontal extensions to lingual arches. He seems to have a practical abhorrence for them if used for the purpose of holding down auxiliary springs, the only object for their use being to render additional stability to molar anchorage, by engaging premolars with the resistance which a wire projecting against a proximal surface will offer in the line of the arch. The most exacting

phase of the lingual arch work is the design and addition of auxiliary springs. In this Dr. Oliver is truly an artist, and he has shown you a variety of designs which are effective and complete.

The care of auxiliary spring wire of any alloy is a most important thing; the preservation of spring temper is essential. I have personally grown to prefer Dr. Mershon's plan of rolling a dwt. of 14 K. solder through a mil. to about one-half its thickness, then cutting minute pieces from it. These may be picked up on the end of the auxiliary spring wire with the aid of the flux and fused with the slightest exposure to the flame. The spring may then be soldered with ease and protection to the arch by heating the larger wire first. This plan also applies to the lingual lock wires.

The lingual locking wires should always be bent far enough out into the mouth and then curved sharply back beneath the post so that it will rest out beyond any impinging contact with the soft tissues, with the end flattened to rest cervically to the tube on the band.

It would be very impractical and almost impossible for all of us to do the same thing in exactly the same way. If there were not variations to be had properly and if things couldn't be done differently, our future prospects would be very poor. The thought in orthodontic technic should be to establish an ideal for the desired results and then adopt a technic which will lead to them. So far as it is possible to copy another person, I believe that Dr. Oliver's technic is a thing which can be studied with a view of following it faithfully. For the perfection of his technic and the good which he has so generously given thereby, Dr. Oliver deserves a great deal of credit.

Dr. W. E. Flesher.—I believe the first time this technic was ever presented before an orthodontic society was in January, 1923, at San Antonio, Texas, at the annual meeting of the Southwestern Society of Orthodontists. Since that time most of the members of the Southwestern Society have largely adopted this technic. It was a hard matter for us from the mere presentation of the technic at our meeting to do the things that we saw were being done by operators skilled in the use of the technic of this appliance, as were Doctors Mershon and Oliver. There are so many details to this technic, gentlemen, that for some time we failed to get the results we should have. We asked if we might not have a more detailed study of the technic than can be had in a meeting.

The more skilled one becomes in the use of this appliance the better will be his results, and, I might also say, on questioning those who have had failures in its use one will find that usually they do not thoroughly understand the delicacy in the manipulations of this appliance.

It was my good fortune to have had a closer insight into this technic through the kindness of Doctor Mershon and Doctor Oliver. I must take this opportunity to thank them for that privilege, for the results have been evidenced in the change of the conditions of the mouths of the children whom I have served. Nothing has ever come into my practice that has been of as much value in the treatment of my cases as the use of the lingual arch appliance. (Applause.)

Dr. Frank M. Casto.—Dr. Oliver's presentation impressed me very much. The various steps in the lingual arch technic were given in splendid sequence and in a clear, concise and logical manner. The slides were exceptionally fine and illustrated clearly every part of the technic. As one viewed the illustrations and listened to Dr. Oliver's explanation of the different points, one could not fail to realize and appreciate the tremendous amount of time and effort and labor involved in the preparation of the subject. In my opinion it is one of the finest presentations we have had before this Society. There is an old saying that the proof of the pudding is in the eating—well I have had the opportunity to make a careful observation of many cases under treatment in Dr. Oliver's office and am prepared to state unequivocally that he is one of the men who practices just exactly what he preaches.

There has been much discussion in regard to the relative merit of the use of the lingual arch. I am strongly inclined to the belief that most of the criticism comes from men who are unfamiliar with the technic as described by Dr. Oliver, and inexperienced

in the application and use of the lingual arch. One needs only to see the cases in Dr. Oliver's office to be convinced of its adaptability and usefulness in the practice of Orthodontics.

I was privileged to take care of his practice for several days a few months ago and it was a delight and gratification to see the results of treatment. While I did not keep an accurate count of the patients, I saw a considerable number, enough indeed to convince the most skeptical that the use of the lingual arch in the hands of Dr. Oliver is a glorious success. I have used this technic for a number of years and its use has been a great satisfaction and gratification to me.

I should be most derelict in my duty if I did not commend Dr. Oliver and express to him my thanks for presenting to the members of our Society, this exceptionally fine and exhaustive description of his lingual arch technic.

Dr. Oren A. Oliver.—Gentlemen, I appreciate very much the discussion of my paper.

From Dr. Kelsey's discussion in regard to the tubes, I probably left the wrong impression. I do not use a half-round tube. The tube which I use is manufactured by Thomas J. Dee & Company. The edges of the half-round wire are oval, and the tube is made to fit the wire very accurately. The walls of the tube are heavier and made of precious metal. This tube has the advantage of having no play or wear in the tube as you have in the Ney tubes.

I have seen the tube which Dr. Kelsey uses and the type of lock, and they work very nicely. I have never used that particular type of tube; I have always used this oval tube, made by Dee & Company, and my reason for changing the lock to the anterior portion from the posterior portion was, as outlined in the paper, to stabilize particularly the body wire so as to eliminate the breakage which we get anterior to the half-round post.

These locks, after they are soldered onto the body wire, should be placed in the flame and dipped in water immediately while they are hot in order that all the spring that is in that lock may be taken out. Otherwise it is preferable to use the soft material which Dr. Kelsey has outlined.

In regard to the band technic, I find that by making bands directly in the mouth I can make them better. It doesn't make any difference to me how your bands are made, whether they are made directly in the mouth or on models. The most important fact is that the bands must fit, because the bands are the foundation of your appliances; and, unless your foundation is good, it is very difficult to build or construct an appliance that fits correctly and that will do the work intended.

In reply to Dr. Hawley regarding the use of the copper band, I find that I can take this band material and pinch it around the tooth and complete the band quicker than I can place on the copper band, take it off, cut it, mark it and solder it back together.

The hairpin spring, which Dr. Dewey has brought to your attention, naturally will eliminate breakage and will also increase the tensile strength in your auxiliary spring, working very nicely, provided you do not make the indentations on your auxiliary springs in bending the wire with the pliers. I think that indentations on the wire by pliers create more breakage than any one thing with which we have to deal.

In reply to Dr. Leonard, as to soldering on the half-round tube or oval-round tube to the body wire, I feel that this half-round tube should be placed directly to the center of the body wire. I can't see any advantage to grooving that half-round tube, because if you place the exact amount of solder on the end of this half-round wire you will have a fine joint, with no excessive solder. If you are in doubt as to this, place it under a high-powered microscope, and you will see how exactly the joints are united. If you place the half-round wire sidewise, that is to say too far lingually or bucally, when you place it into the half-round tube, the body wire is going to extend out and not lie parallel and even with your half-round tube. Personally, I have never had any trouble with the half-round wire coming off the body wire, and I feel that the trouble you have is probably due

to not having clean surfaces, or perhaps heating your solder before you heat your half-round wire, thereby burning your solder instead of getting the large wires hot first and just simply touching with your small round solder. If the foregoing instructions are followed, I do not think you will have any trouble with the half-round posts coming off.

In reply to Dr. Ferris, I have seen some of the attachments which he has mentioned, worked out by Dr. Murlless, and I think they work very nicely.

In reply to Dr. McPhail, I will say that if you ball the end of an auxiliary spring, you will undoubtedly take out better than fifty per cent of your tensile strength in that wire. No auxiliary spring of any type should ever be balled.

In reply to the question as to how I keep from taking the temper out of the wires, as you will recall, I place a very small amount of solder on the body wire. I place the body wire over the flame and just the moment that solder begins to flow, I simply touch the solder with the .020 wire, and it unites almost before I can move the wire. In soldering on the .020 wire, you naturally take out a certain amount of the temper from the wire, close up to this particular joint; but when you form your auxiliary springs by bending them to conform to the position you wish them to occupy, you restore the original temper of the wire.

In regard to materials, the wires which I have found most satisfactory in my hands, after having tested all wires, are the wires manufactured by Thomas J. Dee & Company. The band material, half-round tubes, and solder are also manufactured by Dee & Company and are very satisfactory to work with.

Dr. Henry C. Ferris.—Do you use an electrical heat treating apparatus, Doctor?

Dr. Oren A. Oliver.—No, I do not, but I think it is perfectly all right if you want to use one. You are perfectly safe in using the electrical heat apparatus, and it unquestionably is of great value. If you cannot properly master the soldering technic, I would advise you to use the electric tempering machine.

You may probably think I have made this too primary, but your President asked me to give the technic in every detail, and if it is not given in full detail, there are so many steps which you may miss which will cause you trouble later on. For that reason I presented it as I did.

In reply to Dr. Eby, I wish to state that after the band has been pinched around the tooth, soldered and placed on the tooth, if it can be forced up to the gingival margin by biting it up or driving it up, it is too large.

In removing the band, after it has been forced, probably one-third of the way up, the band is removed and bellied with the Mershon plier, which makes it larger in the middle and smaller at the occlusal and gingival margin. When that band is complete, it snaps into place. When it is seated, it is impossible to force it farther up either by the band driver or the Mershon band pusher. If the band becomes loose, it does not work up into the tissues.

In regard to the direct and indirect technic, I gave the direct technic because that is the technic which I use. I can make a better band in much less time by using the direct technic. The thing I am particularly interested in is that our bands must be made to fit, because they are, after all, the foundation of the appliance. In constructing a large building if the foundation is not correct the building is going to fall; and in our work, if our band technic is incorrect, we are going to fall, and great will be the fall.

In regard to the soldering technic, I think most men are prone to use too much solder. I believe that we should perfect our soldering technic to the extent that when we have united the joint there is no polishing to be done except where you have the end of a wire cut off; and in constructing appliances they should be finished as each step progresses, and when the appliance is completed, there is no further polishing to do except with sulphuric acid.

I appreciate very much the kind remarks which Dr. Casto and Dr. Flesher had to make although I seriously doubt if all of them are true because I have my troubles the same as anyone else. I do try to construct these appliances in every respect so as not to create

any pressure on the gingival tissue to create irritation, and I think we should take more particular care to see that they are absolutely correctly constructed to be as nearly perfect as possible. By so doing I feel that we will get better results, the patients will be more comfortable, and we will accomplish a great deal more.

I appreciate very much your kind attention to a paper of this length and assure you that within a short time the paper will be in print so that you may have an opportunity to study it. I thank you. (Applause.)

THE CAUSE AND EFFECT OF QUANTITY AND QUALITY OF SOLDER EMPLOYED FOR ORTHODONTIC APPLIANCES

By Julius Aderer, New York, N. Y.

THE joining of two metals by means of another metal of a lower fusing point, called solder, is effected by the union of solder and the surfaces of the metals so joined. In other words, a new alloy is formed consisting of a mixture of metal and solder. To prove this, solder two pieces of pure gold together by means of silver solder. Silver solder is soluble in nitric acid, and the solution formed will be a greenish color; but the *joint* of two pieces of pure gold effected by means of silver solder is no longer soluble in nitric acid; and if only a very small amount of silver solder has been used for the joint, this soldered joint will not dissolve even in boiling nitric acid. In other words the alloy formed at the joint in this case is rich in gold and consequently of a much higher melting point than the solder employed, and resoldering this piece with even a high grade gold solder cannot possibly disturb this joint.

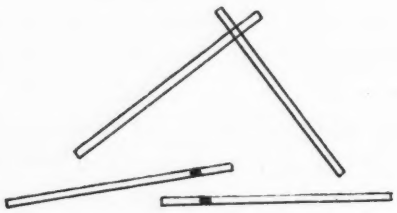
The lesson we learn from this is that when employing a comparatively low grade or low fusing solder, the resulting joint is in every point reliable and inconspicuous, providing also that a relatively small quantity of solder is employed.

Those interested in an experiment to prove that the quantity of solder employed has more bearing on the so-called deterioration of an alloy than the fusing point of the solder, should take a piece of pure gold from 0.005 inch to 0.010 inch thick, and flow first a piece of low fusing solder about ⅛ inch square on the surface of this gold. If sufficient heat is employed, a hole will form where the solder was, and around the inner circle of this hole, an alloy of pure gold and solder. Now, if the same grade of solder is employed but only the size of a pinhead, a hole will not form; or as the saying is, the solder will not "burn through" if great heat is applied, rather will the edges of the pure gold sheet melt. A dark spot may appear on the opposite side of the gold sheet where the solder was placed, but upon applying more heat that spot will disappear.

Gold solders of a comparatively low fusing point furnish a much stronger joint than solders of a high fusing point, that is, *on elastic platinum-gold wire.* I have proved this on a number of occasions with practical demonstrations. To those still doubting the correctness of the above statement, I recommend the following experiments in order to convince them:

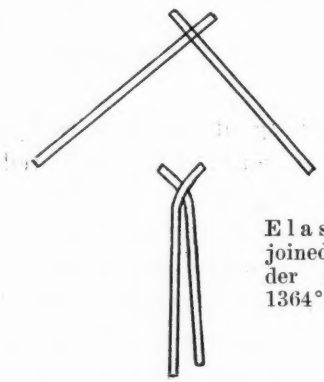
Take four pieces of elastic platinum-gold wire, each about 1 inch long of about 18 gauge, and solder them at right angles to each other, one set with high fusing solder say of a melting point around 1500° F. or 1600° F., and the other set with gold solder melting around 1350° F. or 1400° F. (See sketch below.)

The one soldered with high fusing solder will snap off when pressure is applied to the ends of the wire with thumb and forefinger, while the joint of the two wires soldered with low fusing solder will not give or break even when pliers are employed. As a rule, the wire itself will break at one point or another if enough bending and twisting is done in the attempt to break the joint. *Very tiny pieces of solder should be used of each grade solder.*



Elastic wires joined with solder melting at 1580° F.

A



Elastic wires joined with solder melting at 1364° F.

B

There is no other explanation of this phenomenon that I can give except that the low fusing solders alloy with the gold to a greater depth than those of a higher fusing quality. Some orthodontists may claim that a low grade solder should not be employed for orthodontic appliances. To these I have this to say: In the first place a low fusing solder does not necessarily mean a low grade solder. Solders 590 fine and 660 fine may be obtained that melt at a temperature around 1400° F.; furthermore, the small amount of solder that should be used can never be of any consequence, not even with silver solder, providing that only a proportional tiny bit of solder (the smallest practicable piece possible) is employed.

(To be continued.)

LOCKING DEVICE FOR LINGUAL APPLIANCE*

By Dr. Thomas R. Sweet, Oakland, Calif.

THE appliance I wish to describe is a locking device replacing the much used half-round tube and shaft. This lock is complete within itself, thus making it possible to lock the arch in place without the use of solder or attachments on the arch wire.

The lock consists of two parts: (1) a piece of tubing two millimeters in length to fit the size of arch wire to be used and (2) a McCoy open tube. The two millimeters piece of tubing is soldered to the molar band parallel with the long axis of the tooth and behind the distolingual cusp enough so that it will be out of the way of the tongue. This tube should be placed gingivally enough so that from one to two millimeters of the band extends above the top.

The open tube is placed on the lingual surface of the molar band parallel with and from one to two millimeters gingivally from the occlusal edge. It is placed as far forward on the band as is possible with the opening at about forty-five degrees upward.

For the posterior tube any good platinum gold alloy can be used but for the open tube I have found that the tube made from the Wilkinson's open tube material is best as it is heavy enough to withstand long continual service.

It has been taken for granted that the molar bands have been finished to the operator's liking. The tubes are then soldered to place. The bands are now fitted on their teeth and inspected to see that they are in the proper relation. A compound impression is now taken with the bands in place. After chilling the compound thoroughly the impression is removed from the mouth. The bands are then removed from the teeth and placed in the impression. Wax is then poured into and over the tubes so that the plaster will not enter. The impression can then be poured with plaster or plaster and marble dust equal parts and separated. The construction of the arch may now begin. After annealing the arch wire, make a bend at right angles two millimeters from the end. Fit this in one posterior tube and make necessary bends so that it follows through the open tube on the same band. The arch wire can now be moulded with fingers and pliers to the lingual surfaces of the teeth, allowing it to pass through the open tube on the opposite band. It can now be marked over the opening of the last tube, removed, bent at right angles at the mark and cut off two millimeters below the bend.

The arch can now be replaced in all four tubes, when with the aid of heat it can be formed to the operator's desire.

The advantages of this locking device over the half-round tube and pin are many. There is little or no stretching of the parts. What little there is can readily be taken up in the open tube.

*Read before the Meeting of the Pacific Coast Society of Orthodontists, San Francisco, Feb. 20, 21, 22, 1928.

The lock is much longer mesiodistally than the half-round tube, thus giving a firmer grip on the anchor teeth and a more stable arch.

All parts are small and can be kept from impingement on the gum tissues.

There is no solder on the arch wire, thereby practically eliminating breakage.

It can be removed and replaced with greater ease. A sharp-pointed instrument placed under the arch wire readily snaps it out of the open tubes, allowing it to be lifted out. To replace, the ends of the arch are started in the posterior tubes and with finger pressure snapped into the anterior tubes.

DISCUSSION

Dr. W. W. Leslie (Fresno).—President Dinham, Members of the Society and Guests: When I was asked some time ago to discuss this paper, Dr. Sweet wrote that he could not see where there was anything to discuss and now that we have heard all about it, I think you will agree that there is no chance to discuss nor cuss. He has shown us a simple lock and we did not think it possible to devise anything more simple than the old, reliable half round D.L. 10 lock. I have never used it, however, although with many of the rest of you, I will try it out at an early date. The mere fact that no solder is incorporated with it, is a good point in its favor. As you all know there is always that chance of crystallization and breakage at or near the solder.

Simplicity is quite a feature of this locking device and it is well that we keep that point in mind when making any of our appliances. "The least appliance for the least time" should be a good rule in most cases.

At present I can see only one possible weakness in Dr. Sweet's lock and that is at the open tube. However, if he will guarantee that my kids can not flip that arch wire out with their tongues in a couple of tries, well, I'm with him a hundred strong.

Years ago in school, I debated on that question, which causes the more harm, the tongue, or the pen. It's no question in my mind any more.

Dr. Sweet can well be proud of his lock, and I wish to thank him for the very able method in which he has presented it to the Society.

President Dinham.—Any further discussion?

Dr. Mann (Seattle).—I notice on the model that the open tube was set at an angle so that it apparently opened slightly upward. Is there any reason for that, Dr. Sweet?

Dr. Sweet (Oakland).—I want to thank Dr. Leslie for his kind discussion of my paper. Answering Dr. Mann's question, the open tube opens upward at about a forty-five degree angle. It makes it easier to remove and it does not bow the arch quite so much in taking it out and replacing. If the opening were straight toward the tongue, you would have to spring the arch a little more to remove it, and if it is pointed straight up, the inside lip of the open tube is too short, i.e., you cannot get hold of it with a pair of pliers to take up the slack. You should leave a slight upper lip. This upper lip should project out enough to allow the beak of a plier to engage it.

Dr. Morehouse (Spokane).—What gauge material do you use?

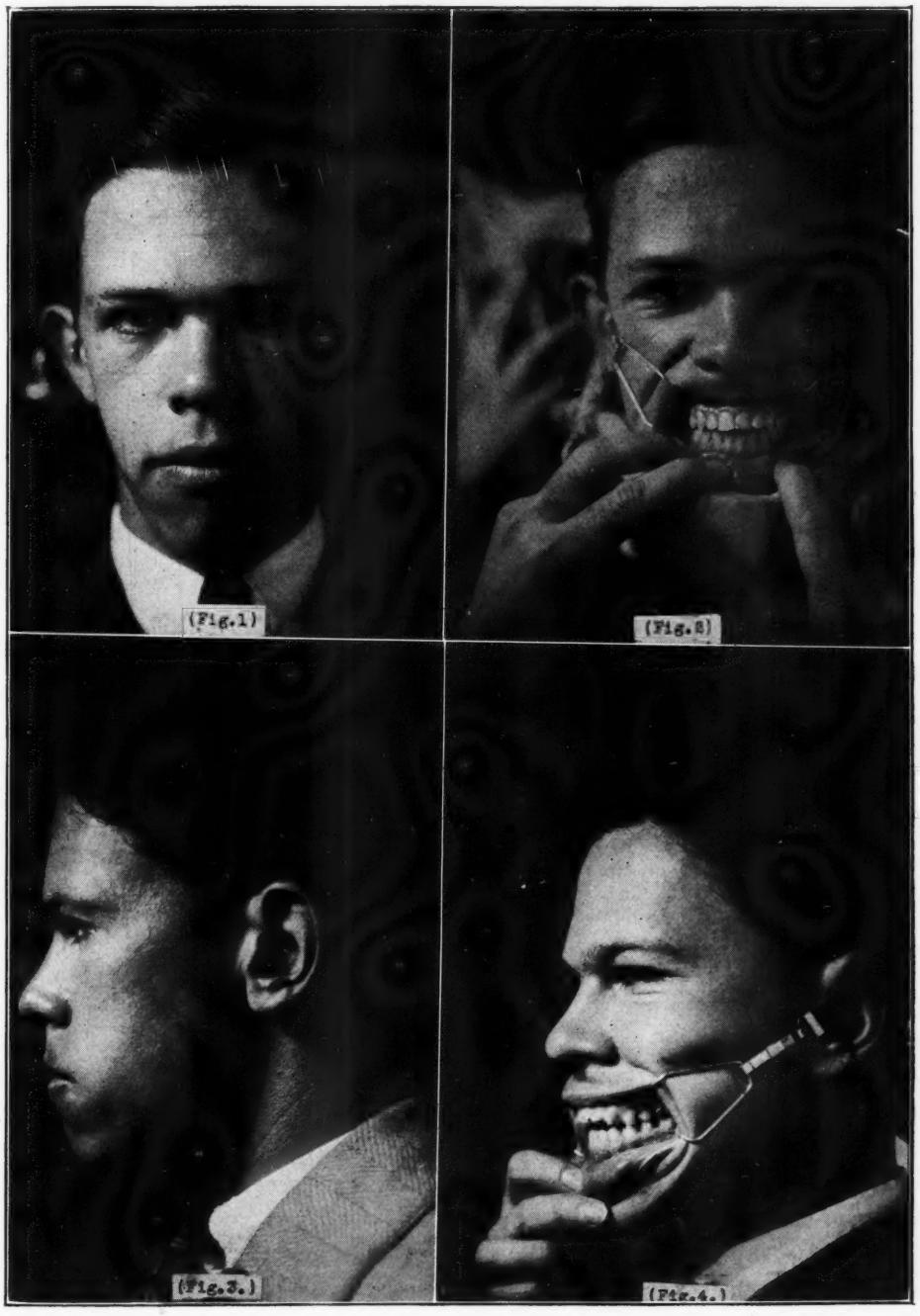
Dr. Sweet (Oakland).—Wilkinson makes an open tube material. I think the original McCoy tube was made of that material. It comes in a ribbon and is called Wilkinson's open tube material. I do not know the gauge.

A SIMPLE SYSTEM OF ORTHODONTIC PHOTOGRAPHY*

By Clinton C. Howard, D.D.S., Atlanta, Georgia

DEFINITE value of photographic records in the practice of orthodontics has long been recognized by the author and has been consistently employed by him for the past fifteen years.

Every case presented for treatment, regardless of the type of malocclusion, is recorded by photographs representing *at least* four different poses.



*Given before the First International Congress.

Our routine includes a full face, Fig. 1; a full face with lips retracted, Fig. 2; a full side face, Fig. 3; and a full side face with lips retracted, Fig. 4.

After years of experimenting with various methods and equipment, it is a genuine satisfaction to announce a procedure, coupled with an inexpensive equipment, which renders a result in keeping with the detailed exactness of an orthodontic practice.

DESCRIPTION OF EQUIPMENT AND METHODS

Figs. 5, 6, 7, 8 and 9 are "staged" illustrations. In explanation, our equipment was placed in a professional photographic studio. This was made necessary on account of the small dimensions of our office photographic

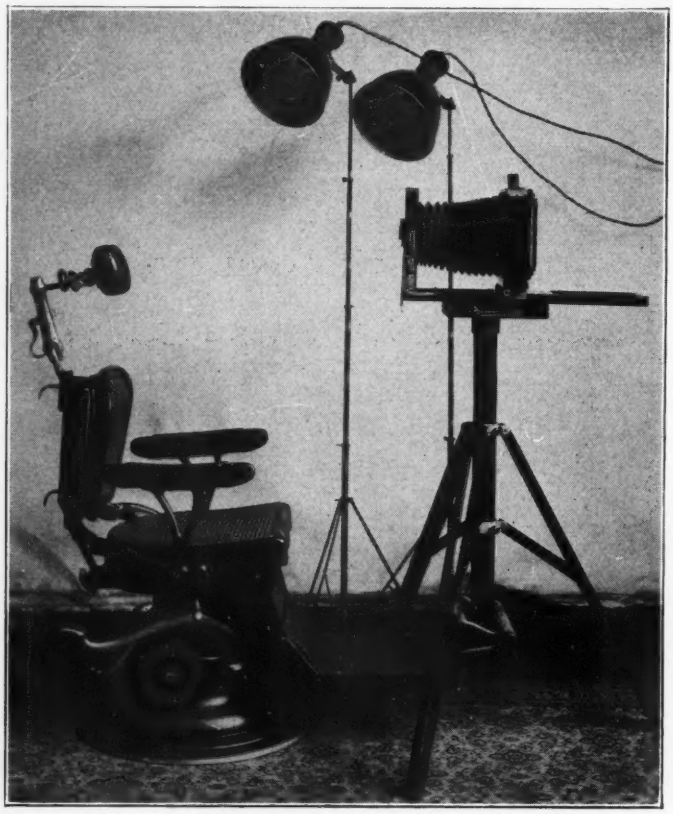


Fig. 5.

room. Our own photographic department, shown by Fig. 10 is used in our ordinary routine. In Fig. 5 are shown the three outstanding essentials of an orthodontic photographic equipment, namely, a standard dental chair of any desired make, an Eastman clinical camera, and the two electric lamps furnished with the camera. (The alterations of the outfit will be described later.)

In Fig. 6 we are attempting to illustrate the several cardinal principles of orthodontic photography.

First. By the use of a dental chair the subject is raised or lowered so that the middle face occupies a position on a horizontal plane with the center of the lens. This is an advantage over raising or lowering the camera. (Explained later.)

Second. The camera, *being first* adjusted to take a one-half life-size picture (as indicated on top of carriage) is shifted to a position which causes the object to come into a perfect focus. Now, a "measuring-stick" is cut, its

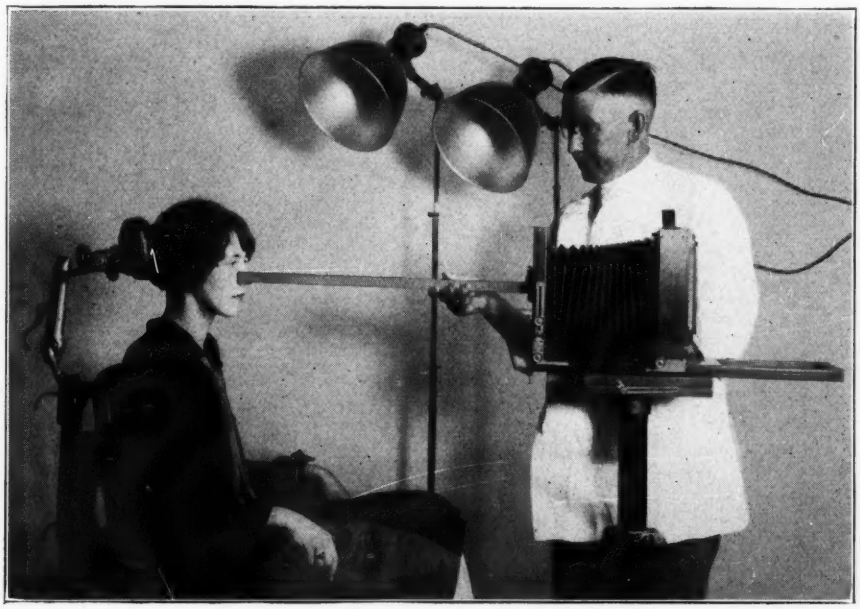


Fig. 6.

Fig. 7.—The method of obtaining correct distance from the camera to subject for profile of teeth. This eliminates the focusing of camera and also obtains a perfect uniformity of all photographic records.

length being exactly the distance between the lens and the root of the wing of the nose. After the "measuring-stick" is once obtained, *all future focusing of camera is eliminated,*—a decided and obvious advantage. The shutter is set at F 77; the time at ½ second.

Third. Artificial lighting is a decided advance in orthodontic photography. With the lamps placed at the proper distance from the subject and aided by a reflector (see Fig. 8-*A*), the variance of daylight with the uncertain

Fig. 8.—The same as Fig. 7 for profile of face only. The "measuring-stick" is unnecessary as the correct distance was just previously obtained.

Fig. 9.—This picture should be made immediately after Fig. 6, therefore the correct distance from lens to subject would have been previously determined.

element of time exposure is entirely eliminated. Figs. 7, 8, and 9 are explained in the legends.

ALTERATIONS, ADDITIONS, ETC.

In Fig. 10 a general view of our photographic record room is pictured. There are two most striking changes in the standard Eastman equipment.

First: The elimination of the camera tripod. It is noted that the camera rests on a T-shaped shelf 46 inches from the floor. This permits the easy shifting of the camera to meet the distance of the "measuring-stick" from the face to the lens.

Second. The two lamps are hung on brackets screwed to the wall. The lamps are 5 feet 6 inches from the floor, at an angle of 45 degrees to the right of the patient and about 36 inches from the subject's face.

It is with satisfaction that these measurements are given, as it required hours of experimentation and hundreds of exposures in order to arrive at a proper lighting.

A lead box 12″ x 8″ x 10″ is shown on the right of Fig. 10. This contains all unexposed films. The protection from x-rays is obvious.

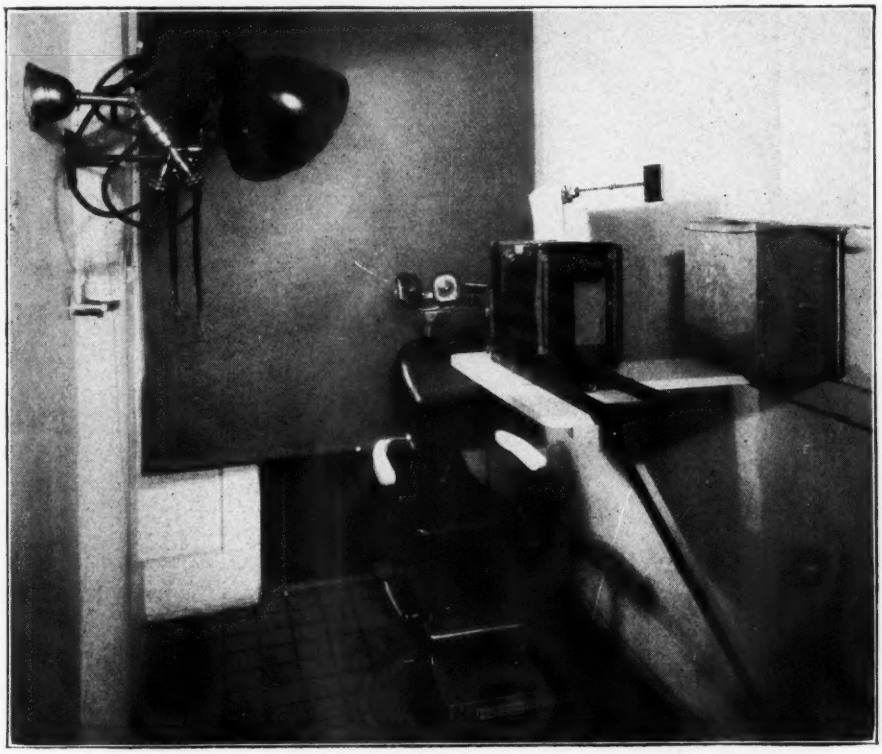


Fig. 10.

Cheek retractors are made from 14 gauge base metal wire and are attached with cloth-covered elastic.

A "level" (glass tube nearly filled with water) can be attached to the center of the "measuring-stick" as an aid in placing the patient in the exact horizontal position to the center of the lens. This, however, may be unnecessary with the experienced eye.

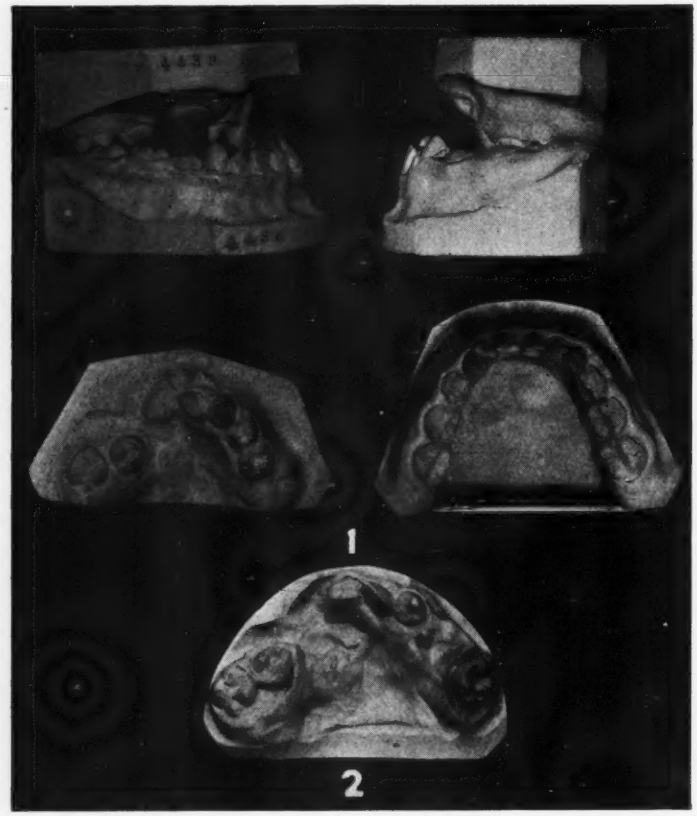
By employing the above method it is readily recognized that practically all personal element of error is eliminated. In our practice, four pictures are made in as many minutes. Their uniformity does not vary; their cost is trivial; and, finally, the objections offered by men who procrastinate about photography are inexcusable.

CASE OF CLEFT PALATE WITH HARELIP SHOWING NECESSITY OF CONTINUING TREATMENT THROUGHOUT ERUPTIVE PERIOD OF THE TEETH TO SECURE MAXIMUM DEVELOPMENT*

By Harry E. Kelsey, D.D.S., F.A.C.D., Baltimore, Md.

THIS is merely a further report of a case already illustrated along with some others several years ago.

Like all cleft palate cases which have been in my hands already, it shows the necessity of continuing treatment throughout the developmental period of



the patient and sometimes beyond this, in order to secure for him the greatest possible benefit from orthodontic treatment.

This patient's speech is now good, and when the restoration which he will have later is put in, I believe it will show another decided improvement. At the outset it was almost impossible to understand him.

Fig. 1 shows the condition of the patient's dental arches at the time treatment was begun. The central incisors were tipped palatally until they pointed almost back toward the throat. It could hardly be said that he had a maxillary arch; it was so shortened as to be not far from a straight line from molar to molar.

*Read before the Annual Meeting of the American Society of Orthodontists, Buffalo, New York, April 30, May 1, 2, 3, 1928.

Fig. 3.

Fig. 4.

Fig. 2 shows palatal conditions after about a year or eighteen months. The small opening which occurred in the palate was the result of carrying the depressed anterior teeth and supporting structures forward, thus opening a fissure which was later closed up by a plastic operation.

Fig. 3 shows marked growth and development of the maxillary arch.

Fig. 4 shows still further development.

Fig. 5 shows the maxillary incisors outside of the mandibular incisors, as they should be, and illustrates also the large space between the central incisor

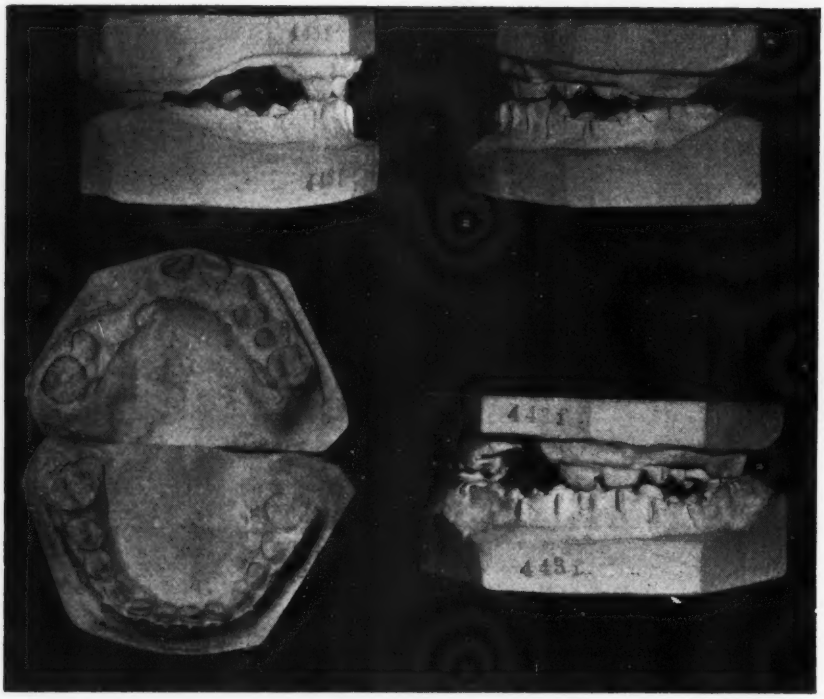


Fig. 5.

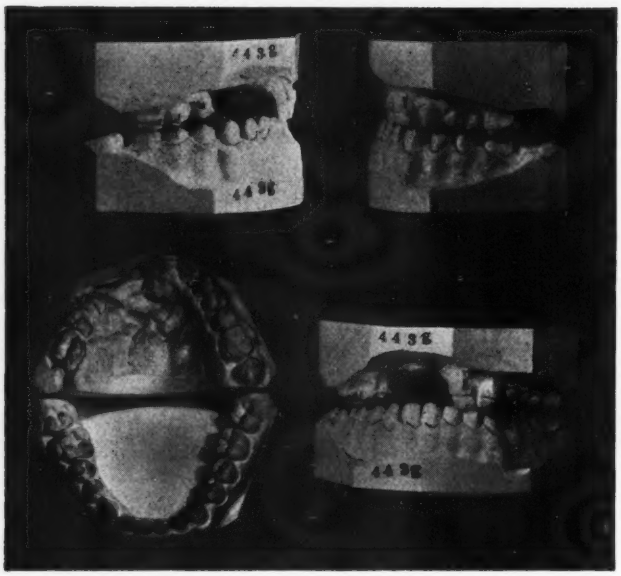


Fig. 6.

and second premolar, this central having formerly been almost in contact with the deciduous molar preceding this premolar. Note also that the second permanent molars have not erupted. Models were made in 1922.

Fig. 6 shows further growth and development which has taken place since that time, the case being under constant orthodontic stimulation. Note that the second molars have erupted, and also the right maxillary canine which is shown on the distal side of the original cleft, one of the premolars on that side being congenitally absent.

Fig. 7 shows x-rays of the third molar areas. Both maxillary third molars are present and exerting a developmental stimulus on the maxillary arch. As a matter of good fortune the mandibular third molars are not present.

Of course much better impressions can be secured when all appliances are off the teeth, but the object of this presentation is to show that such structures as are present in cleft palate cases are as amenable to orthodontic stimulation

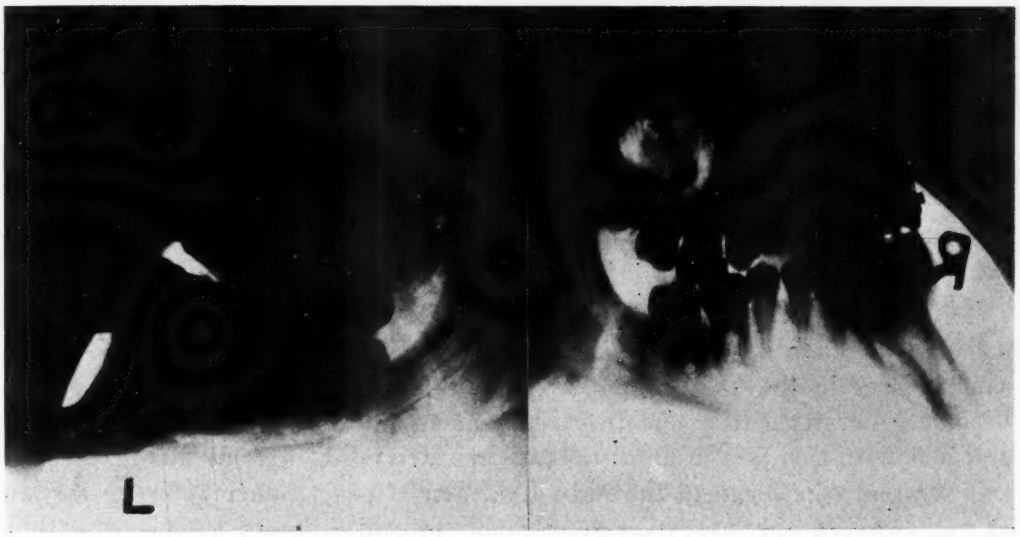


Fig. 7.

and show as good response to a developmental stimulus as do the more complete structures in other patients, and it is, therefore, our duty to continue the stimulation as long as further development can be secured. Intervals during which treatment is suspended may be advisable as in other long orthodontic cases.

The main difference between these cases and others is that no actual structures are missing in the latter and the malocclusion may be corrected, after which development can proceed along natural lines. Cleft palate cases, however, having more or less tissue missing, will relapse and cease to develop without retention or continued artificial stimulation largely because there is never a normal continuity of the bone established across the fissures.

DEPARTMENT OF
ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

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ACTINOTHERAPY IN DENTISTRY

By John F. X. Murphy, D.D.S., New York, N. Y.

Instructor in Oral Surgery Clinic, New York University, College of Dentistry

SINCE the introduction of actinotherapy to the medical profession, many changes have come about in this science which permit of its use in the same degree in the field of dentistry. The knowledge of actinotherapy has become generalized to a certain extent among the foremost dental specialists, and it is with this fact in mind that we are striving to extend this great curative weapon of science to the individual dental practitioner in order that he as well as his brother specialist may be able to utilize these weapons, so helpful and beneficial professionally to all of us associated with the healing arts.

In writing this paper we are interested in two major considerations: first, to be of service to the dental practitioner who has been aroused to the great possibilities of this means of therapy; second, to stimulate our lax fellow practitioners, so that they will be able to understand and know the proper place it deserves in their thoughts and practice.

As we all know, or should know, sunlight is necessary for life. This fact has been proved true as far back in history as the teachings of Aristotle (350 B.C.), who proved that plants and animals could not live or thrive in a healthy condition without sunlight. Since that time further experiments proved the opposite, that many parasitic organisms and certain forms of lower life could not live in the presence of sunlight. Further research enlightens us to the extent that not alone sunlight and the thermic activity derived from it are the necessary components for life, but the ultraviolet rays emanating from the sun are the most beneficial.

Now, do not think for a moment that ordinary exposure to sunlight will bring ultraviolet action to any being. No, quite the contrary. It is only in certain climates that it is possible to attain this benefit from sunlight. For example, a person residing in a cosmopolitan area where the etherial transmitters are dense and heavily laden with smoke, dust and impure particles cannot

possibly hope for ultraviolet activity, because all of these rays are filtered out and lost long before they reach such an area. However, high, clear mountainous areas or seashores far away from commercial activities are blessed with these beneficial rays, for which the sun was meant. Considering these facts then, is it not plausible to assume that in order to receive these beneficial rays, it is necessary to resort to mechanical means, or actinotherapy?

It would be well to note at this time that we do not claim that ultraviolet radiation is a panacea for all the ills to which we are subjetced. That is not the case, but we will say that by its judicious use, coupled with sufficient knowledge of both its good and harmful effects, we have at our command another weapon to eliminate suffering and disease and decrease to perhaps half, the length of time of former treatments.

We do not have to be ill or afflicted to derive benefits from this therapy. It is not set aside solely as a cure; it is also a preventive. Take the case of a healthy individual whose manner of living deprives him of the benefits of sunlight. Is it not obvious that such a person should resort to a means so readily applicable as ultraviolet therapy?

I have been very fortunate in becoming associated with the New York University Clinic of Oral Surgery. At this clinic ultraviolet radiation is employed extensively, and under the supervising tutelage of Dr. Leo Winter and Dr. L. V. Hayes sufficient practical knowledge has been acquired through the treatment of a vast number of cases to state with impunity the meritorious results obtained. The lamps employed are the Alpine sun lamp, an air-cooled, mercury, arch machine of the ultraviolet type, the Sollux lamp, purely thermic in action, and the Kromayer, or water-cooled, mercury, arch, ultraviolet machine. All these lamps are used according to the individual case. Each one has its peculiar action, and all types are used in treating certain cases where their united action is necessary. A number of cases have been compiled and summarized, including many important and interesting cases which might present themselves to any dental practitioner. In enumerating, the writer has confined himself strictly to the purpose of this paper, as has been heretofore mentioned.

To make this paper interesting and of some value to the general practitioner we will consider first those cases most common to all dentists and which should be treated by the Kromayer lamp, the most practical lamp for general use. Following this, those cases usually confined to the dental specialist will be enumerated; the treatment of which may require the use of the Alpine sun lamp, or the Sollux lamp, or perhaps the combination of both.

Acute Vincent's Infection.—Patient, Mr. J. C. of Brooklyn, presented himself at the New York University Oral Surgery Clinic for the treatment of an acute Vincent's infection about the maxillary left and mandibular right molar areas. Oral examination revealed a vast amount of sloughed tissue and the typical festooned areas covered with a grayish-white necrosis which upon removal left a highly inflamed vascular membrane. History of case showed that the patient had visited four dentists in a period of two weeks. Each dentist applied different drugs. From some he received temporary relief, but from others none whatsoever. Ultraviolet rays were applied using the Kromayer lamp

with quartz applicators directly to the area affected. The first treatment began with a two minute exposure exerting pressure, which produced a third degree erythema. This treatment was given on Saturday. The patient was instructed to stop smoking and to avoid any highly seasoned or spiced foods, which might act as irritants, and he was told to return on Monday morning, which allowed one day to intervene between treatments. Monday morning when the patient appeared for the second treatment, he said when asked how he felt that he was relieved greatly Saturday and part of Sunday, but Sunday night he began to feel a little uncomfortable again. It was noticed at this time that the fetid odor of the breath, so common to Vincent's disease, was practically missing, and that the sloughed tissues did not appear as outstanding as before, and that bleeding did not occur readily. The second application consisted of two and one-half minutes' exposure about each infected area. The patient was dismissed until Wednesday morning. When he appeared for his third treatment, his mouth was examined, and apparently he was cured. A third application lasting for three minutes about each area was given. The patient was then dismissed with instructions to return the following morning. The case was dismissed and proved the value of this means of therapy.

Chronic Vincent's Infection.—Patient, Mr. F. P. of New York City, was recommended by a dentist for treatment. Patient's history dated back to the days of the World War. It was at this time he first noticed the disease. He was treated by army physicians overseas, and when he returned to the United States, he was treated by the Veteran's Bureau, from which place he was discharged as a cured case. At frequent intervals from then on he had recurrent attacks and visited numerous dentists, all of whom had a different drug to use, and each gave him periodic relief. All local causes that might have agitated the recurrent attacks were eliminated; and then, working in conjunction with his physician, we eliminated any systemic ailments which might have been factors. Smears of the infected areas were made which proved the presence of the fusiform bacillus and spirochete. The patient ceased drinking alcoholic beverages and smoking and adhered to a lenient diet which was prescribed. We then instituted ultraviolet treatments with the Kromayer lamp and prescribed a sodium perborate mouth wash. These treatments were administered exactly ten times, and to date (about six months since his first treatment) the patient has not had the least semblance of a recurrence. His habits are normal; he has ceased the diet, and smokes as usual. All the pockets about the teeth have healed; the membrane has attached itself about the neck of the teeth, and the patient's mouth is once again in a very healthy state.

Rarefied Bone.—Patient, Miss R. M., twelve years old, presented a condition of rarefaction about the apices of the mandibular four anterior teeth. Etiology was due to an injury sustained while playing. She fell and struck her mandibular teeth, loosening and devitalizing them. Root therapy was instituted, and an apicoectomy and curetting was advised. Instead, however, we resorted to ultraviolet treatments. First her teeth were braced to support and immobilize them. Then we began the biweekly administration of ultraviolet using the Kromayer lamp. For five treatments of two-minutes exposure very little improvement was noted. The time of application was increased to

three minutes under pressure, and after five more treatments an amelioration of the condition was noticed. We continued treatments until practically all signs of rarefaction had disappeared. The visits were reduced to one weekly, and the rays were concentrated on one tooth, a mandibular right lateral, which seemed to be more resistant to the treatment. This area was curetted, and now, judging from all indications, we are positive that this one tooth will be returned to a healthy state in a very short time. The wires have been removed; the teeth are solidly fixed; and the patient does not complain of the least discomfort. In all there were about twenty treatments.

Postoperative Pain.—Cases of this type are so numerous and so many have been treated with success that not one can be found sufficiently interesting to mention. Let it suffice to state that following any operation at the New York University Oral Surgery Clinic where a good deal of trauma might have occurred, administration of ultraviolet rays, using the Kromayer lamp directly to the part, then at the foramen of the nerves supplying the part, and buccally and lingually, alleviates the postoperative pain that formerly occurred. Numerous times after extractions patients will return complaining of pain. In cases of this kind we apply the Kromayer lamp quartz applicator directly into the socket, then buccally and lingually, and at the foramen from which the nerve makes its exit.

Condition Commonly Known as "Dry Socket."—Patient, a student at a local university, applied for treatment for this condition which appeared three days after the extraction of a mandibular second molar. Patient complained that his pain was so annoying that it interfered with his studies. Ultraviolet radiation was applied, using the Kromayer lamp, directly into the socket for two minutes, at which time it was noticed an immediate inflow of blood occurred. The patient was dismissed and instructed in the proper hygienic care of his mouth. Patient returned the following day, relieved of pain. One more administration was given, and the case was dismissed.

Many cases of neuralgic pain have appeared at this clinic. The majority of these cases have been edentulous, or partially so, for a great while. X-rays taken show no causative factor. Now, instead of scarifying these areas or injecting alcohol, and thereby rendering the mouth uncomfortable, we localize the pain to a certain area and then apply ultraviolet treatments, using the Kromayer lamp. These exposures have in the greatest majority of cases proved successful, but in some cases we have not been able to alleviate the pain, which was due probably to some deep-seated disorder. In such cases we resort to the use of the Sollux or thermic lamp, using the blue filter, and follow this with the Alpine lamp and then the infra-red therapy. This blue filter is quite helpful in all neurotic pain conditions to produce an anemia and allow the passage of the infra-red and ultraviolet rays which produce a hyperanemia.

Pyorrhea Alveolaris.—This type of case requires a great amount of skill in treating. Incipient periodontal diseases are quite common, yet certain very resistant cases present themselves to each of us for treatments. Many of the milder forms can be cured successfully by scaling away any calcareous or irritating substances, curetting the root surfaces, relief of traumatic occlusion and perhaps the use of an epithelial solvent where pus pockets may be present; but

the resistant case, the one whereby our ordinary treatments seem useless, are the conditions in which we find ultraviolet radiation most useful. Here we can use this creation of science to stimulate to activity the dormant tissue cells or even go deeper to stimulate the afflicted bone. Now, do not assume from what is said that ultraviolet radiation will cure all of these cases—quite the contrary. We must first determine the etiologic factors which cause the disease and remove them, then and only then will the ultraviolet rays act. We cannot hope to cure a disease which produces symptoms in the mouth when the offending factor lies systemically. It is very often the case that when many of our difficult cases appear, we do not strive to determine the etiology. A history of the patient's general health and perhaps a consultation with the patient's physician would help us to attain more success in treating periodontal diseases.

I have visited many dentists and have been informed by many of them that they have been successful in obtaining a cure for their resistant cases by using the Kromayer lamp. Of course, the prognosis must first be established. The treatment of a periodontal disease should not be attempted where it is found from x-ray examinations that there has been such a vast amount of bone and tissue destruction that the apices of the teeth are just about covered. Such cases will not respond to any treatment, nor can we expect to perform miracles with ultraviolet radiation. Let us repeat once more that an ordinary case of periodontal disease, where we have a favorable prognosis or even one bordering between a favorable and an unfavorable prognosis, will in all probability be cured by the proper and judicious administration of ultraviolet therapy, using the Kromayer lamp with the quartz applicator in conjunction with the proper scaling and operative procedures. The treatment of pyorrhea is a radical treatment when using the Kromayer lamp. The irradiation must be given under pressure, and a third degree erythema must be produced.

Fistulas.—Mr. C. presented with a fistula about the area of the maxillary left second bicuspid. History taken shows that the fistula had been present for a number of years; in fact, the patient could give no cause for its appearance, nor did he know it was present until he had been so informed by his dentist. At times the patient complained of a bad taste in his mouth, and upon examination a slight amount of suppurative matter was noticed, due probably to food impacting in the tract. History further revealed no luetic infection in the patient or in the patient's family. The patient's mother bore ten children, all of whom are living; the patient's parents died very late in life, much past seventy years of age. The patient was employed for eighteen years as a printer, and we thought at first that perhaps the fistula was caused by an occupational disease, due to the ink or to the lead dies. The fistula was probed, but no opening into the sinus was found. Ultraviolet treatments were resorted to, placing the quartz applicator directly into the tract. These treatments were continued once a week for six or seven weeks, and to date we have succeeded in obliterating the suppuration and shortening the length of the tract to an appreciable extent. We hope to heal this fistula completely by the constant application of these rays.

Periapical Infections.—Patient presents a condition of a large area of infection about the maxillary right central incisor. Tooth was vital, non-mobile. Ultraviolet treatments were given twice weekly for a period of three weeks. X-ray pictures were taken each week to determine the progress of the treatment. They show the gradual obliteration of the infection, until finally the entire area was clear, and all signs of infection were gone. The technic of such a treatment is local application of the Kromayer lamp, using straight applicator. The ray must be concentrated as nearly as possible to what we can judge to be the apex of the tooth. The application must be given under pressure to afford deeper penetration of the ray, and a third degree erythema must be produced. Applications should be given buccally and lingually, and the entire area should be irradiated to build up resistance of the surrounding tissues.

The next type of ultraviolet therapy useful to the dental practitioner is the type used for its general diffuse action. This brings us to the use of the Alpine sun lamp, an air-cooled, mercury arch lamp. Before continuing, however, with this means of therapy it would perhaps be well to differentiate between the therapy derived from the Kromayer lamp and that derived from the Alpine lamp.

Both lamps are of the mercury arch type. The ultraviolet rays emanating from both are formed by the transmission of electric energy through mercury vapor, which forms a central ray of light which is ultraviolet. There are four main differences, however, which cause these lamps each to have a separate use: First, we find that the Kromayer lamp is a water-cooled lamp, whereas the Alpine is air-cooled. Second, the rays emanating from the Kromayer lamp are short and of slight penetration, whereas those rays of the Alpine are long and of deeper penetration. Third, the Kromayer lamp gives off rays which are more germicidal than those of the Alpine lamp. Fourth, the Kromayer lamp is used only for local applications about small areas and affords close proximity of the source of light to the portion of the body needing treatment; the Alpine lamp is used for general application where a diffusion of the rays is needed.

Some very interesting experimental work has been carried on recently, which proved the efficiency of the Alpine sun lamp in treating dental ills. Vague as it may seem, the fact remains that a great amount of success has been attained by the application of diffuse ultraviolet rays from the Alpine sun lamp. To state the results of past experiments both in the laboratories and upon animals and men may perhaps enlighten us and make more clear those pessimistic opinions to which we are all prone.

First, erythema, is an indication of the reaction of the tissue to ultraviolet exposures. Following this, there is a desquamation of the tissue followed by pigmentation. This pigmentation proves the action of the melanin bodies of the blood.

Second, the systemic action, the most useful of all to the dentist, is analgesia in painful areas. Lassitude and fatigue disappear, a feeling of well-being is established, muscular agility is increased together with mental activity.

Third, various blood changes are undergone, such as an increase in calcium, phosphorous iron blood platelets, and bactericidal properties. A rise in the number of blood cells is brought about, together with a glandular activity. Now with these facts in mind, is it not obvious that the dental profession should accept this means of therapy in treating those cases which appear not only in the oral cavity but also in the adjacent tissues where dental intervention is necessary?

Science has provided us with another weapon in the form of the Sollux lamp. This lamp is purely thermic in action and emanates rays whose therapeutic value is equally as important as those of the ultraviolet type, the infra-red rays. One great contributory factor of infra-red therapy is penetration. It has been proved without a doubt that these rays will pierce through 3 cm. of tissue before being absorbed. This power of penetration can be increased by lengthening the time of exposure. There are two actions to this type of therapy. One action is superficial and the other deep. The first action or hyperanemia is obvious as soon as applications are begun. The latter has its action on the deeper tissue which absorbs the infra-red rays. These rays are absorbed by muscle tissue and also by inflammatory exudates. These actions were first proved by Dr. Murray Lenick of London in 1915 when he used this type of therapy in a case of infantile paralysis, whereby he restored to a normal condition muscle which had atrophied to such an extent that there was no response to any type of stimulus. (Humphries.)

The therapeutic action of the infra-red rays is very simple. It is similar to the response that tissue will give to applied heat. The first physiologic effect upon the body is vasodilatation of the irradiated area, bringing about a noticeable hyperemic condition in the superficial tissues. There is following this a capillary congestion and a local increase in the number of red corpuscles. The rays have an inhibitive action on the nerves of sensation, and it is from this action that the analgesic property is derived. There is also a power in these rays to cause resolution and absorption in areas of infiltration and will, no doubt, establish an equilibrium in the cells which they meet in a physicochemical manner, which action would naturally favor a healthy tissue change. Each and every one of these factors mentioned is most beneficial to the dentist in treating cases of pain, inflammation, or when tissue and bone destruction have taken place; and to prove the usefulness of this type of therapy a number of cases of interest to the dental practitioner will be stated which will prove conclusively the availability of both ultraviolet and infra-red therapy to the individual practitioner. In many of these cases both the infra-red and ultraviolet rays will be used. The purpose of this has also been proved. In cases when it is necessary to have deep penetration, the usual procedure is to first resort to the Sollux lamp, utilizing a blue filter which will produce an anemia, then follow this with a diffuse application of ultraviolet rays for superficial therapy. The purpose of the anemia is to afford deeper penetration of the ultraviolet ray which would ordinarily be hampered by blood and tissue fluids and then follow this with the infra-red rays to reach those deeper areas afflicted. In other words, one type of rays prepares the field affected for the other type.

Tic Douloureux or Trifacial Neuralgia.—Mrs. M., seventy-five years old, admitted to the New York University Oral Surgery Clinic, January 29, 1929. History was taken which eliminated any operative procedures or ailments which might have caused the condition. Patient's chief complaint was of intermittent pain. This had its origin about the area of the mental foramen on the right side of the face, terminating at the right temporal area. The patient's mouth was edentulous. X-rays were taken of the entire ridge area, right and left lateral plates, bite films, maxillary and mandibular; and x-rays were also taken to determine condition of the sinuses. The attacks of pain would appear about every ten minutes and remain for from thirty seconds to one minute. During each attack the patient would suffer intensely. Patient had been treated for her nerves by a physician, who recommended her to us for treatments. We examined the dentures which the patient was wearing but found them to be well fitting. The removal of the dentures or their presence in the mouth did not alleviate the condition. The area affected was localized to the mental and inferior dental branches of the fifth nerve by injections of novocaine which relieved the patient temporarily. At first we thought it advisable to inject alcohol, but considering the age of the patient and her unwillingness to submit to such a procedure, we began treatments utilizing the Sollux and Alpine lamps.

The first treatment consisted of a fifteen-minute exposure of the Sollux lamp, using a blue filter to produce an anemia about the painful area, and immediately following this a fifteen-minute exposure to the infra-red rays. The patient was instructed to return the following day and when questioned told us the only relief she had was for a short period following the treatment. At this time we noticed that the skin appeared slightly red but not sufficiently so to hinder a second treatment. This treatment was administered, but the time of exposure was increased to twenty minutes for each type of light applied.

Two days later the patient returned for a third treatment. She told us that she had noticed a slight decrease in the number of pain attacks. At this treatment the procedure was changed slightly by using the Alpine lamp which would allow the irradiation of the area with ultraviolet rays. The usual Sollux lamp exposure was given first, using the blue filter to produce an ischemia, and immediately following this the area was exposed to the ultraviolet rays from the Alpine lamp. This exposure, being the first, was given for about one minute. Following this, the Sollux lamp was again applied, utilizing the infra-red rays. This type of treatment was continued after that time, increasing the amount of time of each exposure to each lamp until at the fifteenth and last visit the time of exposure was thirty minutes of blue filter, five minutes to the Alpine (ultraviolet) and thirty minutes to the infra-red. The treatments were given twice weekly until the patient had satisfied us that her condition had been cured. As a precaution we requested that the patient write us in case she had a recurrence, so that we could instruct her as to the proper treatments she should take. To date we have received no word from the patient. On account of her past sufferings we know she would return at the first indication of a recurrence. This one case proved the usefulness of this

means of therapy; and although other cases of the same type have been successfully treated, this one is mentioned as it afforded us opportunity to recognize at each treatment the decrease in the frequency of the pain, and the reactions of the patient to this therapy, on account of her advanced age, caution had to be taken to avoid overexposure.

Double Fracture of the Mandible, Complicated With an Osteomyelitis.—Patient, Mr. Le B., twenty-six years old, was admitted to the New York University Clinic of Oral Surgery, December 27, 1928. Patient's history reveals that he was struck by an automobile, rendered unconscious, taken to a hospital. There the lacerations on his face were treated and sutured. X-rays were taken which determined the presence of a double fracture. A Barton bandage was applied, which he wore for about a week. No other attempt was made to set the fractures which were located at angle and symphysis of the mandible. Swelling set in immediately. This was followed two weeks later by suppuration and a fetid odor from patient's mouth. He was sent to this clinic for treatment. Here new x-rays were taken which revealed the fractures and an osteomyelitis about the anterior fracture. Incisions were made at the symphysis, and two teeth extracted, which were rendered mobile by the injury and which hindered proper healing on account of their position in the line of fracture. Drainage was established, and the mandible was immobilized by the application of braces. One week after drainage had taken place, we began to treat the case by heliotherapy. This consisted of irradiating the infected areas with the infra-red rays, followed by the ultraviolet exposures, utilizing the Alpine lamp. The first application consisted of thirty minutes' exposure of the infra-red rays and two minutes' exposure of the ultraviolet rays. This amount of application was administered, due to the fact that the patient was a negro and would not be susceptible to burns because of pigmentation. After five administrations of this therapy the first sequestration took place. This type of treatment was continued, gradually increasing the amount of exposure. These treatments were given twice weekly in conjunction with normal saline irrigations, and sequestration became pronounced. Upon the completion of the eighteenth treatment the swelling disappeared and sequestration ceased. Patient was dismissed about two weeks later when healing had become complete and the external wound had properly healed.

The advantages of the infra-red therapy and the ultraviolet exposures proved invaluable in this case. When we first began treatments, the patient's condition was deplorable and appeared to be one that would be quite resistant to treatments. The infra-red therapy facilitated the sequestration process, due to its deep hyperemic action, while the ultraviolet rays acted as a tonic which helped to build up the resistance of the surrounding tissues by its therapeutic properties, which have been mentioned in the introduction of this chapter.

Infection Following Extraction.—Patient, Miss M. M., twenty-five years old, was admitted to this clinic January 24, 1929. History taken reveals that three days previous to admission patient had a molar tooth extracted by a dentist. Dentist recommended patient to this clinic for treatment. Patient's face was badly swollen and inflamed. Swelling extended from the symphysis

under the jaw as far back as and including the angle and ramus of the right mandible. Upon palpation the swollen area was quite firm. A slight superficial suppurative exudate flowed from the socket from which the tooth had been removed. Patient was suffering from some pains in the infected area. Infra-red therapy using the Sollux lamp for a period of twenty minutes was given, and the patient was dismissed with instructions to return the following day. Upon her second visit the infection had pointed, fluctuation was present, and an incision was made at the angle of the mandible and drainage instituted. Infra-red therapy was discontinued at this period until drainage was completed. We then administered ultraviolet therapy until healing had practically been completed. Patient is seen once a week now and superficial irrigations are given to overcome a slight ooze which is present. Ultraviolet therapy will be continued to stimulate healing.

The Alpine lamp is very useful in cases of this kind, as it is beneficial in stimulating rapid healing by its inherent therapeutic properties. The infra-red therapy in cases of this type can work in one or two ways: first, by causing consolidation or absorption of the pus present, and second, by preparing the tissue so that rapid pointing can take place.

It might be well to note at this time that as soon as the presence of pus is indicated, as for example when fluctuation of the area is possible, then infra-red therapy, or in fact any light therapy should be stopped until drainage has been established.

Antrum Infection.—Mr. A. T., forty-four years old, was admitted to this clinic, January 5, 1929. Patient's chief complaint, when admitted for treatment, was pus flowing from the socket of the maxillary right second molar. History taken showed that patient had ten teeth extracted by a dentist. The maxillary right second molar root was fractured and was allowed to remain in place. Patient had a denture made but could not wear it because of pain about the region of the second molar. He returned to dentist, who took x-rays which showed the presence of the root. An attempt was made to remove root which was only partially successful. Patient still complained of pain, and a few weeks later the dentist opened into the area and curetted, and removed root apex which was causing the discomfort. It was at this time that the presence of pus was noticed. The dentist treated this case for eight weeks trying to overcome the flow of pus and then recommended this clinic to him for treatments. X-rays were taken here, which showed a cloudy right maxillary sinus, and treatments were immediately started, utilizing the Sollux lamp blue filter. The time of exposure was fifteen minutes. The first few treatments were of no avail. Patient complained of dizziness and headaches and a constant feeling of malaise. The time of exposures was increased to twenty-five minutes blue filter, three minutes ultraviolet and twenty-five minutes infra-red. After about four treatments the patient would get relief for a day or two, and then the conditions would recur. These treatments were applied twice weekly.

Finally drainage was begun through the nose as well as through the mouth. Saline irrigations were continued followed by the application of heliotherapy in the manner described. At regular intervals during treatments

the patient was x-rayed. Finally, when the last picture revealed a good, clear antrum, the patient was dismissed. In all there were about twenty-five exposures to heliotherapy.

The treatment of sinus infections by means of this therapy has proved quite beneficial. Many cases treated before the advent of heliotherapy were matters of lengthy duration and uncertain success. There are several cases at the present time (the time of this writing) at the clinic which are not quite so severe as the one mentioned heretofore, where slight cloudiness of the antrum has been cured by these applications.

Perhaps at this time it would be well to explain the reason why the different rays are used in conjunction, in the treatment of the cases just mentioned. The introduction to this chapter has perhaps explained the therapeutic action of the individual type of ray, but why their combined action is of more avail will be considered immediately. The Sollux lamp is equipped with an interchangeable lens. One is blue, the other red, and then a third open lens allows the rays formed by this incandescent bulb in the lamp to pass through.

The blue filter when used will produce an ischemic area. This ischemia is beneficial because it has been definitely proved that the presence of blood or tissue fluids in an area will hamper the penetration of ultraviolet rays, in fact, any rays. Now, as we produce the ischemia and follow this with the ultraviolet rays, is it not obvious that these ultraviolet rays passing through an ischemic area can have more penetration and more therapeutic value? The infra-red rays that are then used are for the purpose of producing deep tissue reactions, because in the treatment of cases, as heretofore mentioned, it is necessary to reach the deep-seated tissues to bring about favorable results by producing a deep hyperanemia.

To summarize, the procedure is as follows: first, Sollux lamp, blue filter, to produce an ischemia, which will facilitate the passage of the ultraviolet rays on account of the absence of blood and fluids; second, the Alpine lamp, which emanates ultraviolet rays, which act as a tonic by the production of a superficial hyperanemia and its action therapeutically on the blood; third, the Sollux, infra-red rays for deep therapy in the deep tissues.

Postoperative Pain.—Many cases of this type have been treated successfully by the use of the infra-red therapy. This therapy is used not only to treat postoperative pain but also to prevent it. For example, we all know from experience that an injection of an anesthetic solution containing adrenalin leaves a subsequent soreness, which is most annoying to the patient. This soreness is due to the fact that the adrenalin has constricted the blood vessels and the surrounding tissues, damming back the blood and allowing the anesthetic solution and whatever other substances that may be present to collect there. Now in such cases, it is always well to overcome this constriction by applying infra-red rays, which penetrate deeply, producing a hyperemia, which forces new fresh blood to the area affected and eliminates the feeling of soreness that would have existed. This therapy is useful in cases where a large field of operation is involved, thereby rendering the local use of the Kromayer lamp inadequate.

Postoperative pain has been a factor which caused the patient and the dentist much consternation. The fear of this pain alone, has often forced the laity to set aside any dental work being done where trauma would be set up. Now, however, if the dentist would expose his patient after an operation to infra-red rays, many of these painful aftermaths would be avoided. Infra-red therapy has an analgesic action on local pain areas. We are not sure whether this action is due to the hyperemia set up by its application or by a direct action on the nerve itself, or perhaps on the nerve filtrils which may be situated slightly superficially. We do know from experience with our home remedy of hot application that painful areas have been ameliorated. Realizing that these treatments are only superficial and of slight penetration, why should we not be able practically to eliminate these postoperative pains by infra-red therapy? Do not think that this therapy has proved successful in all cases. By no means, but such success has been attained at this clinic in overcoming any chance of postoperative pain conditions arising after operations that this factor is a worthy one to bring to the attention of all dental practitioners.

ETHYLENE AND CARBON DIOXIDE IN DENTAL ANESTHESIA*

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FADS seem to play a part in dentistry as well as in any other profession. In the past few years we have heard a great deal about two anesthetic fads, namely, ethylene and carbon dioxide.

Let us delve a little deeper into the physiology of these two gases in order that we may better understand the effects they have upon the human body and thus be able to judge more fairly whether these gases should or should not be used in dental anesthesia.

ETHYLENE

Before considering ethylene as a dental anesthetic, let us first consider the requirements of an ideal general dental anesthetic:

1. Ease of administration.
2. Rapid elimination from the human body.
3. Form no compounds with tissues of the body.
4. Cause as little nausea as possible.
5. Noninflammable.
6. Pleasant odor.
7. Produce a smooth analgesic stage.
8. Ease of recovery.

Ease of Administration.—The equipment and technic of administration are practically the same for N_2O as for ethylene.

Rapid Elimination.—Nitrous oxide has a boiling point of −135 F. and ethylene has a boiling point of −137 F. Since both gases have a very low boiling point, the two are readily eliminated from the body.

Effect on Tissues of Body.—Nitrous oxide forms no compounds with any of the tissues of the body. It is, therefore, noncumulative. It produces anesthesia because of its high solubility in the body fluids; and, therefore, it dilutes the oxygen in the serum to such an extent that the oxygen is prevented from reaching the cells in the body.

Ethylene, being an alcohol derivative and a fat solvent, will attack the nucleus of a cell, since it is richer in lipoids. The liver cells, having the largest nuclei, are affected most. Since it forms compounds with these lipoids, it is, therefore, retained in the tissues; and the restoration of consciousness is slower than after nitrous oxide in anesthesias of more than ten minutes' duration. Traces of ethylene can be found in the breath of patients two or three days after administration.

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Some anesthetists claim that ethylene oxygen is as nearly free from effects as is nitrous oxide. This has not yet been fully proved by time and use.

Nausea.—Nitrous oxide, if properly administered, rarely produces nausea, while ethylene causes a great deal of vomiting, especially in light anesthesia. Cases such as anemia, cardiac and other physical states requiring a light anesthesia, are, therfore, much better off and safer under nitrous oxide.

Noninflammability.—In dental operations where the electric engine, cautery and other electric appliances are a necessity, ethylene is absolutely contraindicated because of its high explosibility and combustibility. Nitrous oxide on the other hand is noncombustible.

Odor.—Ethylene possesses an offensive, garlic-like odor that seems to linger for a considerable time. People not accustomed to it will complain of frontal headache. Out of a class of fifteen students, more than half complained of dizziness and headache simply from the odor of the gas in the operating room. In certain classes the percentage was much greater. It can, therefore, be readily seen that in a dental office such an offensive odor would certainly be objectionable.

Analgesic Stage.—Nitrous oxide produces an excellent analgesic stage for cavity preparations. While analgesia with ethylene is possible, it is, however, not practical because of the great amount of vomiting it produces in that stage.

Ease of Recovery.—Recovery of the patient from the anesthetic is more rapid from nitrous oxide anesthesias, and the patient can be discharged sooner from the rest room than after ethylene oxygen. This is an important factor in dental practice, since a sick patient is never a pleased patient.

The high anesthetic potency of a gas is not a prime factor that should favor its use. Prophylene, whose anesthetic potency at 40 per cent is equivalent to acetylene at 78 per cent, ethylene at 85 per cent, and nitrous oxide at 90 per cent, is a dangerous anesthetic, since it produces ectopic ventricular tachycardia. A drug requiring more oxygen for its administration is usually the more dangerous.

We can, therefore, readily come to the conclusion that although ethylene is an excellent hospital anesthetic and is superior to ether in many respects, it certainly does not compare with nitrous oxide and has not and cannot find its place in dentistry.

CARBON DIOXIDE

A good many years ago Lavoisier and Leplace showed that the CO_2 produced by an animal is nearly equivalent to the oxygen consumed, and that the amount of heat formed by an animal is nearly equivalent to that formed in combustion of carbon when equal quantity of oxygen is consumed in respiration and combustion. They thus made it clear that in the living, oxygen combines with carbon and other substances, producing carbon dioxide and other oxydation products.

Human blood contains 2.7 volumes per cent CO_2 in simple solution and 50.3 volumes in chemical combination. The difference between the partial

pressure of CO_2 in human arteries and venous blood during rest is only about 6 mm. or 0.8 per cent of an atmosphere. The physically dissolved CO_2 given off in the lungs is only 0.4 volumes per cent, while actually about 4 volumes per cent are given off. It is, therefore, evident that the giving off of CO_2 in the lungs is almost entirely dependent on the dissociation of its chemical combination in the blood.

Carbon dioxide is a marked respiratory stimulant. Pure atmospheric air contains 0.03 per cent of CO_2 and 20.94 per cent oxygen. When the proportion of CO_2 in the air is raised to 3 per cent and the oxygen lowered to about 17 per cent, the breathing becomes noticeably increased. With further vitiation the increase in breathing becomes more and more marked, until with about 6 per cent of CO_2 and 13 per cent of oxygen the panting is very great with much exhaustion following.

When more than 10 per cent of CO_2 is inhaled, atoxia, stupefaction, and loss of consciousness will result. The effects of excess of CO_2 are readily produced in the presence of a large excess of oxygen and are, therefore, quite independent of the effect of want of oxygen.

The following is the result of an experiment as described by a student upon whom it was performed. He was normally healthy. One day he was given CO_2 10 per cent and O_2 90 per cent for two minutes and the second day under similar conditions was given pure oxygen for two minutes.

"With CO_2 10 per cent and O_2 90 per cent the first few inhalations were fairly normal, but soon I was forced to breathe faster and faster. When the mask was removed, breathing was very rapid (25 per minute). I was perspiring and felt exhausted, as if I had run quite a distance. When I got up from the chair, my knees felt shaky, and during the afternoon I suffered from a dull headache, which was relieved only after having taken a sedative at 6:30 P.M. The experiment was performed at 12 o'clock."

"After taking O_2 for two minutes: There was not the slightest discomfort with this gas during the administration. The inhalations and exhalations became deep and slow (8 per minute). There was a feeling of expansion in the lungs, and no after-effects were experienced."

Carbon dioxide, when not in too great excess, stimulates respiration. When the CO_2 in the gases or air inhaled is of a high percentage, it has a narcotic effect, so that the breathing which is in reality increased at first by raising the percentage of CO_2 in the inhaled gases quiets down again when the percentage becomes too high. Both the want of oxygen and a moderate excess of CO_2 excite the respiratory center, while a too great excess of CO_2 will cause respiratory failure.

Douglas and Haldane have found that with more than 4.7 per cent of CO_2 in the inspired air no apnea could be produced by forced breathing, however hard, in a person whose normal alveolar CO_2 percentage was about 5.6 and that apnea was only produced if the alveolar CO_2 was reduced by more than 0.2 per cent below the normal. It is, therefore, certain that the cause of apnea following forced breathing is reduction in the CO_2 percentage in the alveolar air and that a reduction of as little as 0.2 per cent is sufficient to cause apnea.

The marked sensitiveness of the respiratory center to CO_2 pressure is definite in both upward and downward directions. A mean increase of or diminution of 0.01 per cent in the alveolar CO_2 will produce an increase or diminution of 5 per cent in the alveolar ventilation, that is, 5 per cent of 8 liters or about 400 c.c. per minute in the lung ventilation.

This astounding sensitiveness of the respiratory center to CO_2 pressure clearly illustrates the importance of maintaining a proper CO_2 percentage in the lungs in gas oxygen anesthesia and consequently the importance of the use of rebreathing.

Carbon dioxide also has a great influence on the oxygen dissociation in the capillaries. The dissociation curve of hemoglobin is greatly influenced by the partial pressure of the CO_2 present, the CO_2 helping to expel oxygen from its combination, so that as the blood takes up CO_2 in its passage through the capillaries, oxygen is liberated from the hemoglobin more readily than would otherwise be the case. Consequently when CO_2 is used with N_2O and O_2 anesthesia, we tend to interfere with the absorption of oxygen in the lungs and further dissociate the oxygen in the tissues through the presence of excess of CO_2 in the blood and alveolar spaces.

According to Haldane, the consumption of oxygen and production of carbon dioxide fluctuate greatly. Great exertion, for instance, will increase tenfold the consumption of oxygen and the output of carbon dioxide for the whole body. This important fact explains why a person in the excitement stage of anesthesia is so difficult to manage. The oxygen delivered to the patient is not sufficient to meet the demand made by the body during that stage, and the increased output of carbon dioxide pumps the body dry of this respiratory stimulant. The results are obvious, the patient becomes exhausted quickly, due to the lack of oxygen and carbon dioxide, and passes into the danger zone of anesthesia.

The threshold of alveolar CO_2 pressure at which the respiratory center begins to be excited may be altered by various abnormal conditions. The threshold may be lowered by want of oxygen or by ether in low concentration. The threshold is raised by such anesthetics as chloroform, morphia, or chloral, and under their influence the alveolar CO_2 pressure is raised. These facts are of great importance in connection with the use of anesthetics and show the advantage for combining N_2O and O_2 with proper doses of morphia, which raises the threshold and consequently slows respiration and prevents labored breathing.

When pure nitrous oxide is inhaled, it is first noticed that the inhalation becomes prolonged and the exhalation rather short. As the third stage is reached, there is a noticeable increase in the depth and also frequency of the breathing. The breathing becomes full and machine-like, the inspiration and expiration become equal. As the fourth stage is reached, the expiration becomes prolonged and jerky or spasmodic. The breathing is irregular and sobby. Phonation may occur, then the breathing becomes very feeble, and finally cessation of respiration takes place.

The prolonged inhalation observed in the second stage is due to the reduction of oxygen in the inspired gas, and the primary marked increase in the

breathing is due to the increase in alveolar CO_2 over the oxygen pressure, since there is a drop in alveolar oxygen pressure due to the lack of oxygen in the inhaled gas. The spasmodic and later the very feeble breathing encountered in the fourth stage are due to oxygen want, until finally the spasm of the respiratory muscles occurs, and there is cessation of breathing.

It might seem that a great increase in both respiration and circulation would be the natural physiologic response to anoxemia; since the increased respiration will raise the alveolar oxygen pressure, and the increased circulation rate will increase the amount of oxygen left in the red corpuscles of the blood passing through the capillaries. But the increased respiration lowers the pressure of CO_2 in the respiratory center and tissues, and this lowering rapidly reduces the increased breathing to within relatively narrow limits. A similar lowering of CO_2 pressure in the tissues must be produced by the increased circulation rate, and a falling off in the initial increase of pulse rate is probably due to the same cause as the falling off in the initial depth and frequency of breathing. With a further increase in the anoxemia the heart beats, like the respirations, become more and more feeble.

When oxygen is added to the nitrous oxide as soon as or before the third stage is reached, there are, just at first, distinct signs of increased circulation as well as of increased respiration. But very soon the increased washing out of CO_2 from the blood moderates both the breathing and circulation, and within a short time the circulation as well as breathing quiets down, so that unless the anesthesia is very deep, the increased pulse rate and other signs of increased circulation will practically disappear.

Whenever anoxemia is present, the respiratory regulation works like the local circulatory regulation. The breathing is not then free to increase in such a way as to compensate proportionately for increasing anesthesia, because increased breathing lowers the CO_2 pressure, and this tends to diminish the breathing. Under deep anesthesia, when the arterial blood becomes dark or the patient becomes cyanotic, CO_2 has very little effect on the breathing.

When pure oxygen is inhaled, particularly under pressure, the breathing increases, as shown by a fall of alveolar CO_2 pressure, and there is a simultaneous slowing of the pulse. This indicates a slowing of circulation through the brain, such as would compensate for the high oxygen pressure of the arterial blood. The slowing would, of course, raise the pressure of CO_2 in the brain and thus increase the breathing. It is, therefore, not necessary to use CO_2 with O_2 in resuscitation.

In general, the circulation is so regulated as to keep the pressures of both oxygen and CO_2 approximately steady in the venous blood from any particular organ. The regulation is evidently of a double kind involving both oxygen and the CO_2. If the oxygen pressure goes down and the CO_2 also goes down as in anesthesia, there is comparatively little effect on the circulation rate, because increase due to lowering oxygen pressure is at once counteracted by the effect of diminution due to the lowered CO_2 pressure. Similarly in an atmosphere containing simple excess of CO_2, increased circulation, due to excess of CO_2 pressure, tends to be counteracted by decrease due to increased oxygen pressure. However, should CO_2 be added during nitrous oxide and oxygen

anesthesia, where increased circulation due to excess of CO_2 cannot be counteracted by increased oxygen pressure because there already is a lack of oxygen, an increase in pulse rate and heart beat must necessarily occur.

While CO_2 in dental anesthesia is comparatively new and is still in its experimental stage, the facts are that CO_2 will overstimulate the respiration and will cause deep breathing. Deep breathing means labor, labor leads to exhaustion, exhaustion leads to shock.

If the dentist or anesthetist will only endeavor to master nitrous oxide and oxygen, he will have no need for any of the anesthetic fads.

DEPARTMENT OF
DENTAL AND ORAL RADIOGRAPHY

Edited By
Clarence O. Simpson, M.D., D.D.S., F.A.C.D.,
and Howard R. Raper, D.D.S., F.A.C.D.

THE MINIMUM REQUIREMENT OF A GENERAL RADIODONTIC EXAMINATION

By Dr. Clarence O. Simpson, St. Louis, Mo.

A SALESMAN who "cut" some of his teeth and lost all of them in the dental trade once remarked that dentists reminded him of sheep; that naturally they stood still, but after getting them started they all ran in the same direction. He should have excluded specialists who run in different directions and cannot be stopped. For about twenty-five years after radiography was first used in dentistry, it was customary to limit the examination of the teeth to ten views. At present there is a tendency to adopt fourteen views as a standard for a general radiodontic examination, probably by many operators for no better reason than that a two-syllable examination sounds more impressive than a one-syllable examination. Lest it be twenty-five years before there is another advance, the requirements should be analyzed and considered before adopting a new standard.

Since the purpose of a radiodontic examination is not merely to reveal the teeth, but conditions in and around them, thoroughness is essential. An examination is thorough only when the full possibilities of the method are utilized in securing information. Without a definite procedure, a hundred views might not utilize the possibilities of a radiodontic examination, because all of them could be technically deficient. The number has little significance when the film packets are carelessly placed, and the rays are directed without regard for anatomic landmarks. Some degree of system is a prerequisite in discussing the number of views if they are even to include all the teeth.

The only tenable restrictions in radiodontic examinations are the safe limit of exposure to radiation and the endurance of patients. The excuse that the prevailing fees do not justify thorough examinations is an admission of either imbecility or dishonesty. The radiodontic fee scale was not established by the laity but by dentists, either directly or by connivance with commercial laboratories. The fees for all other dental service have been greatly advanced during the last ten years through a realization that the service could not be adequately and profitably rendered at the former scale. If radiodontic service cannot be adequately and profitably rendered at the prevailing fees, there should be an equitable adjustment of fees. Excepting charity and professional

courtesy, anyone who renders efficient radiodontic service without ample compensation is foolish. Anyone who slights radiodontic service because he cannot afford the time or the exorbitant expense of film packets to render it thoroughly at the fee he charges is guilty of deception. This dilemma is not imaginary, for when dentists are shown thorough methods of examination, the unanimous and truthful response is that it cannot be done for the customary fee. Therefore, professional integrity should be restored by establishing radiodontic service on an honest basis.

The maximum number of views required for a thorough examination depends upon the difficulties encountered. This element of uncertainty precludes a standardization of number, just as other standardized radiodontic methods are erroneous, but there is a minimum requirement in the number

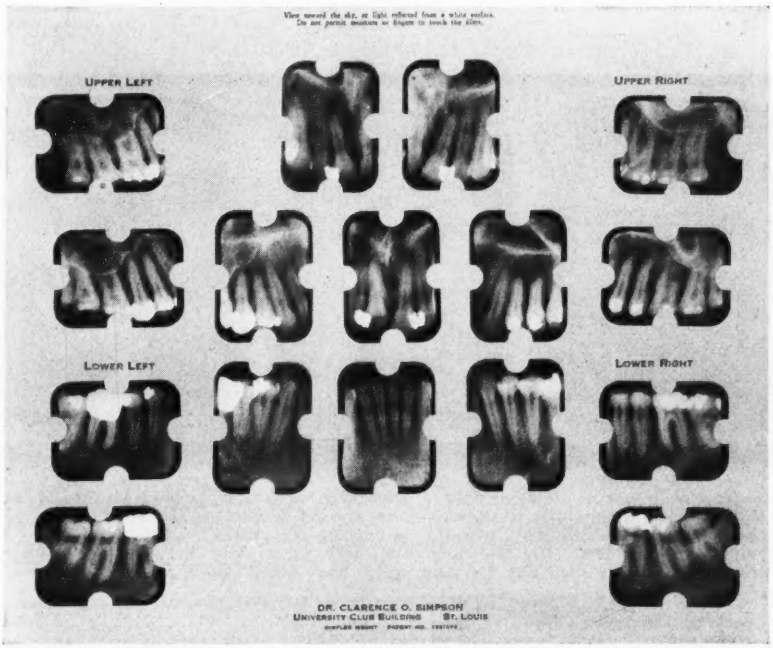

Fig. 1.—An illustration of a sixteen-view radiodontic examination. By closely observing the teeth included in each view, a systematic procedure can be adopted.

of views. On account of the curved dental arches, the diversity of the buccolingual and longitudinal axes of the teeth, the difference in root formation and overlying structures, there are definite limitations in grouping of teeth for diagnostic views. The maxillary first and second molars can rarely be shown to advantage in the same view because of superimposition of the malar process. The mandibular first and second molars usually require different views because of the diversity of the buccolingual and the longitudinal axes. If the third molars are present, the complications are increased. Consequently, in each molar region one view is required for the second and third molars, and another for the first molar with which the bicuspids may be included. This is the allotment of eight views. To avoid distorting the images of the long cuspid roots, the adjacent teeth are generally foreshortened in radiographing this region which necessitates a view of each cuspid and raises

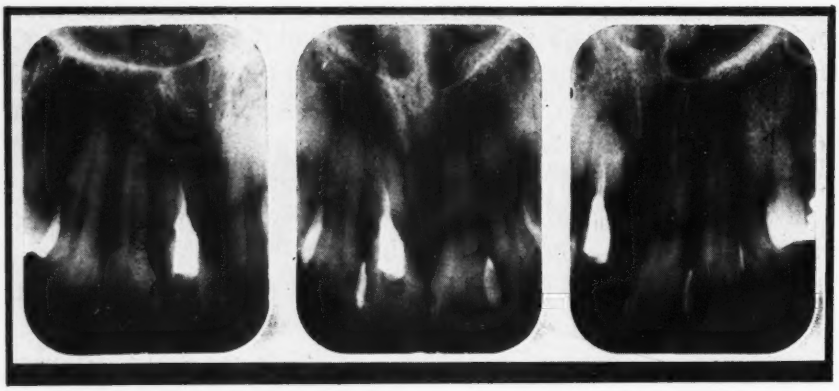

Fig. 2.—In the median view, the nasal septum obscures the periapical status of the pulpless central incisor. In the left diagonal the bone involvement from this tooth is clearly revealed. The right diagonal view verifies the evidence of the other views.

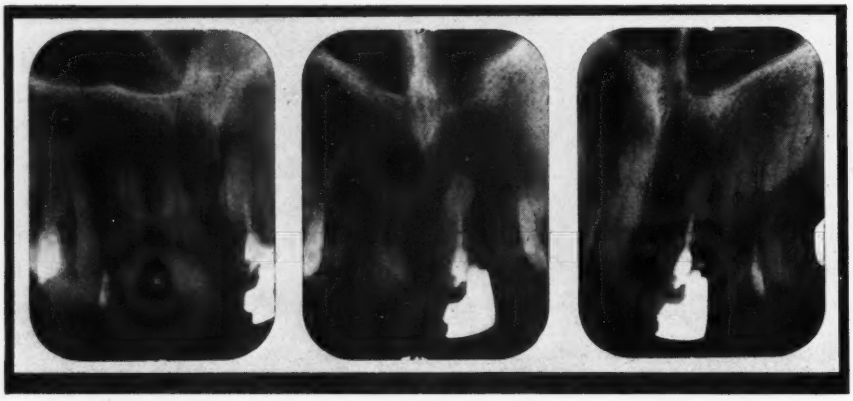

Fig. 3.—In the median view, the large incisive foramen is superimposed at the apices of the central incisors. The right diagonal view shows a narrow zone of radiolucence around the apex of the right central incisor, but the superimposed incisive foramen might be mistaken for an extensive involvement. In the left diagonal view, the incisive foramen is projected away from the right central incisor leaving only the slight area of radiolucence.

Fig. 4.—A narrow arch in the median view of which there is marked distortion of all the incisors excepting the right central. The right diagonal view more clearly discloses the destruction around the apex of the right central incisor and presents a normal image of the lateral incisor which was projected off the film in the median view. Also, radiolucence is seen over the lingual root of the first biscuspid which is often included in the diagonal view of the incisors. The left diagonal view gives no additional information on the right central incisor because of the distortion produced by the narrow arch but reveals the left central and lateral incisors which were distorted in the median view.

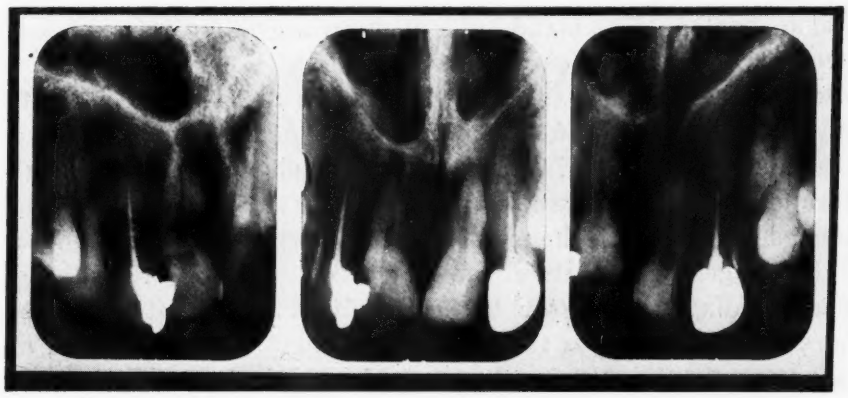

Fig. 5.—In the median view the four incisors appear suspicious, although there is no trace of a canal operation in the centrals. The right diagonal view indicates a marked involvement from the right central incisor but none from the left central incisor or the right lateral incisor with a defective canal filling. The left diagonal view corroborates the evidence on the central incisors and reveals a radiolucent zone around the apex of the left lateral incisor.

Fig. 6.—In the median view, the central incisors with extensive silicate restorations, but no canal operation, appear equally suspicious. The diagonal views conclusively show destruction around the left central incisor and none around the right. The vitality tests confirmed the radiographic evidence.

Fig. 7.—From the median view, the incisors probably would be exonerated as a source of infection as they had been upon two recent occasions when the teeth were "x-rayed." A radiodontic examination with diagonal views reveals the bone involvement and necrotic apex of the right central incisor. The left diagonal view supplies the most conclusive evidence and emphasizes the necessity of including the root of the opposite central incisor in the diagonal view.

NOTE.—Three of the preceding illustrations were selected from thirteen consecutive examinations of the maxillary incisor region made during the writing of this article, which demonstrates the frequently indispensable application of the method. In every examination of the region the diagonal views increase the accuracy of interpretation.

the total to twelve. The mandibular incisors are likely to make a favorable group for the thirteenth view. The remaining view of the fourteen standard is allotted to the maxillary incisors which raises the point of contention.

In a median plane view of the maxillary incisors, to which a fourteen-view examination is limited, there is an unfavorable combination of the mesiodistal arc of the teeth and the divergence of the rays. When the central rays are directed parallel with the median plane between the central incisors, ordinarily the images of the lateral incisor roots are distorted by the diverging rays passing diagonally through the distally inclined lateral incisor roots. The more sharply curved is the arch, the greater is the distortion, and in an extremely narrow arch the images of the lateral incisors will have no resemblance to the teeth. In addition to the great distortion occurring in a median view of this region, the nose is almost always superimposed upon the teeth. The lower border of the nose is registered as a diagonal radiopaque line of demarcation near the necks of the teeth. The nasal septum obscures one or both of the central incisor roots. The radiolucent areas of the nostrils are likely to be registered near the apices of the central incisor roots and create perplexity or misconception regarding periapical conditions.

To secure the essential diagnostic information and avoid confusing images in radiographing the maxillary incisor region, the median view should be supplemented by right and left diagonal views. In each of these views, the corresponding central and lateral incisors are clearly shown, and included are eccentric views of the corresponding cuspid and opposite central incisor which often are of great value. Some operators have attempted to depend upon the two diagonal views and dispense with the median view. This is fallacious because, usually in the diagonal views, the incisive foramen or anterior palatine canal is registered near the apices of the central incisors and the alae of the nose are superimposed on the lateral incisor roots. The median view is needed as a check on these features and to supply adequate information regarding the region.

The earnest and emphatic plea is hereby made for three views of the maxillary incisor region, and sixteen views as the minimum requirement of a general radiodontic examination. In addition to the essential inspection of the pulpless teeth present, silicate restorations, porcelain jacket crowns, and the risk of traumatic injury increase the probability of degenerative pulps in the maxillary incisors. The advantages lie not only in discovery but also in exclusion of dental disturbance from the confusing images which are characteristic of this region. This feature is especially indicated for adjourned examinations in which the exposures are all made before the films are developed, by improving the prospect of accurately revealing conditions. Thorough radiodontic examinations are promoted by having the films developed as the exposures are made, so errors may be corrected and the doubtful evidence verified. To accomplish this, the number of views will vary with the anatomic and pathologic factors involved, but sixteen must be the minimum requirement as any unprejudiced investigator can prove by adopting the system for a trial period.

ABSTRACT OF CURRENT LITERATURE

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA
DENTAL RADIOGRAPHY
By Dr. Edward Preble, New York City

NUTRITION AND PEDIATRICS
By Samuel Adams Cohen, M.D., New York City

It is the purpose of this Journal to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Orthodontia, Oral Surgery, Surgical Orthodontia and Dental Radiography

The Antagonism Between Dental Caries and Pyorrhea. F. W. Broderick, London. Am. Dent. Surgeon, xlix, 3, March, 1929.

This essay originally appeared in the British Dental Surgeon and is reprinted by permission. The entire subject is not taken up in the paper but only certain aspects. That a certain antagonism exists is evident because caries is really a disease of very early life, while the reverse is true of pyorrhea. But an essential antagonism is difficult to prove. We know that the two processes may coexist, but this is no disproof of antagonism. Leading authorities believe in an antagonism but do not seem to lay much emphasis on it. Many agree that one affection seems to exclude the presence of the other, for whatever reason and even the public knows that some people's teeth decay and never become loose while in another group the teeth loosen and fall out but never seem to decay. Granting the existence of this surface antagonism, what is desired is to explain the reason for it. By one group of dentists the two processes are said to occur side by side, and this association is very common. But here there must be some weakness in our definitions. Caries and marginal gingivitis certainly occur side by side, but the latter must not be visualized as an incipient pyorrhea. The conditions which precede caries, such as mouth filth, also make for marginal gingivitis. When a dentist tells one that pyorrhea is common in the young and is seen in association with caries, he is right only when the gingivitis really leads up to pyorrhea, and this sequence the author regards as the exception. In another article he will take up the subject of the differentiation between gingivitis and pyorrhea, for this appears to be the vital point in the controversy.

Prevention of Caries by Control of the Bacillus Acidophilus. R. W. Bunting (Ann Arbor), J. Am. Dent. A. **16**: 2, 1929.

The author with three women coadjutors, Mme. Crowley, Hard and Keller, reports a continuation of former efforts in the same direction. It has been shown in his opinion that the bacillus in question is a necessary factor in the

mechanism of caries causation. It appears in much greater quantities in the mouth after the age of eight years, and up to the age of twenty years is almost constant in the mouth, after which age it tends to diminish. In the mouths of immunes to caries it is absent. During the past two years the author's group has studied the effects of diet on the bacillus in 500 children. The diet employed consisted of a well-balanced regimen with omission of sugar and flour as far as possible. This was followed in the majority of cases by a decrease in the number of bacilli although without any uniformity. In the cases in which the reaction was negative caries was absent, and in general the evidence seems overwhelming that the bacillus with its acid property is necessary for the development of this condition, irrespective of what other causal factors may coexist. This being the case, it would seem to be a simple matter to prevent caries by bactericidal or alkaline lotions. But unfortunately substances which destroy the bacillus in vitro do not succeed as actual mouth washes. There is no doubt that some of the bactericides, such as metaphen, can accomplish considerable in the way of prevention, but it seems that some strains of the organism are able to resist the bactericidal action. Hexylresorcinol is also of value, and the two may be alternated. In discussion A. L. Walters pointed out that the B. acidolphilus is a friendly organism as shown by the use in artificially soured milks; he believes that eliminating it from the mouth may lower the resistance of the child to certain intestinal diseases.

Blood Counts in Dentistry. Editorial in Am. Dent. Surgeon **26**: 1272, 1929.

Blood counts in medical practice are increasing in importance both from the standpoint of diagnosis and with regard to selection of operative cases. Both acute and chronic infectious processes may be detected, and we may also infer to what extent such infections have undermined the general health and resistance to disease. In dentistry most of the operative work is comparatively trivial and the effect of such operations on the system negligible; but exceptionally even the extraction of a single tooth may cause an operative shock. Mass extraction is a very different proposition, but the shock here is minimized by extracting only a few teeth at a sitting. When, as must sometimes happen, a mass extraction must be made at one session, it is desirable to obtain blood counts before operation. If there is any deviation at all from the normal limits, it must be taken into account; it makes no difference whether the red cells are less or more abundant than normal, whether there is a leucocytosis or leucopenia, etc. Any change in the normal blood formula is apt to mean an augmented tendency to postoperative hemorrhage. Recently a German dentist (Linkner) has published her researches in 57 cases of dental affections. A hyperemic pulp and acute pulpitis both give a notable leucocytosis which vanishes on extraction. Chronic pulpitis is usually free from changes in the blood count, but occasionally the status is that of acute pulpitis. Periodontitis is without much modification of the blood counts, but in periodontal abscess there is a marked leucocytosis, subsiding promptly on evacuation. Just at present no rules for procedure can be laid down, but there is every reason to believe that in the near future routine blood counts will be taken in certain groups of cases before proceeding to operate.

Pan-Chewing and Pyorrhea. R. Ahmed (Calcutta), Indian Dent. J. **4**: 2, 1929.

Pyorrhea has both local and constitutional factors, and the author is convinced that the habit of pan-chewing belongs to both groups. The teeth of the people of Hindustan are conceded to be superior in every way to the teeth of Europeans and Americans. Although largely immune to caries, pyorrhea constitutes a veritable scourge for them, the reverse being largely the case with the Euro-Americans. This has been explained by the vegetarian habits of the former and also by a hypothesis of racial deficiency of the peridental membrane. Thus far the habit of pan-chewing has received but little attention, although it is known to promote callus formation. In the absence of exact statistics it is believed that this disease is almost universal in people past the age of thirty-five years. The writer in examining 100 people at random found that 78 of this number had or had had pyorrhea. The substances chewed in pan-chewing comprise those believed to promote digestion, including an alkali, astringents, carminatives and deodorants; and even the educated Indians believe that the habit is beneficial to digestion. But the truth is that the pan-chewer is usually dyspeptic. Pan is a good deodorant and carminative, and the red stain answers the women as a lip stick. It consists in reality of an astringent leaf on which are placed a smear of catechu, a smear of lime and bits of betel nut and spices. Some addicts chew a hundred of these boluses daily, the result being an overproduction and waste of saliva. The fibers of the leaf also get wedged between the teeth, and in general every inducement is supplied for calculus and pyorrhea to develop. The habit is most unesthetic, and the author has for a long time conducted a crusade against it as causing pyorrhea and cancer and lowering the digestion and general health. He omits stating whether abandoning the habit is followed by spontaneous improvement.

Nature of Caries. Abstract from files of the Brit. Med. J. Orth., Oral Surgery, in Dent. Surgeon, April 27, 1929.

Attempts to connect caries in man with vitamine deficiency seem doomed to failure if this affection is studied in coolie members of the darker races who live side by side. Diet plays an indirect rôle perhaps but in quite a different fashion, and immunity from caries may be plausibly connected with cleanliness and exercise of the teeth. Thus Dr. J. W. Field of British Malaya has improved his opportunities for prolonged observation of the Tamils of Southern India and the immigrant Chinese. About 50 per cent of the latter show caries compared with 6 per cent of the Tamils. Diets are traditional for both types of the coolies, are not based on market values, and are far from ideal, being both monotonous and unbalanced. The Chinese live on polished rice but also have vegetables fried in oil, cured fish, and fat pork. They spend about twice as much per capita as the Tamils. The latter also live mainly on rice, pulse, and maize with cured fish, but eat very little in the way of fresh vegetables. Analysis of these diets shows the absence of any element pointing to deficiency of vitamine D. The Tamils practice a dental hygiene, quite assiduously brushing their teeth with powdered charcoal and rinsing the mouth

after each meal and also chewing the betel nut. The Chinese, on the contrary, have no dental hygiene worth mentioning, and the soft rice lodges undisturbed in the interstices of the teeth. The Chinese in general are hardy and resist infection far better than the Tamils, and the latter's superior teeth cannot be attributed to bacterial defense any more than to vitaminiferous diet. There is abundant evidence that the coolies of the tropics have abundant exposure to ultraviolet rays and much of their food shares this advantage.

Painful Sockets Following Extraction. J. Schroff and H. A. Bartels (New York), J. Dent. Research **9**: 2, 1929.

The authors incidentally report 8 cases of this sequence and then comment as follows: The discovery of the Vincent bacilli and spirochetes in painful sockets is doubtless without significance, although it is a remarkable coincidence that all of the patients in the series presented this find when pain was present, and that the organisms vanished with the pain. The authors sought to disinfect the mouths of patients before extraction by the use of sodium perborate, which does not destroy but exerts a bacteriostatic action on microorganisms. In 400 cases this precautionary measure was used, but post-extraction pain was present to some extent in 5 per cent. Unfortunately they neglect to mention the normal proportion of these cases in unselected material for comparison, although it must be more than 5 per cent for the authors think it worth while to recommend the use of the sodium perborate as a routine practice before extraction. Other causal elements may be present, for the solution of perborate being injected warm into the socket *after* extraction as a secondary measure involves keeping the socket open, and the authors have noticed that in painful sockets there is mostly an occlusion of the opening. Moreover, if pain is present, relief is immediate. Hence in any case after extraction the socket must be kept open. In rare cases there may, of course, be a special reason for pain, such as fracture of the process. The general belief of the profession is that after-pain is due to wearing off of the novocaine; this seems impossible, and it is more liable—as far as analgesia is concerned—to occur in cases of improper injection technic. Extractions of certain types of teeth may rarely be accused as in those with hypercementosis.

Subacute Osteomyelitis of the Mandible. F. Lemaitre and Ch. Ruppe (Paris), Rev. de stomatol. **31**: 3, 1929.

The authors give three case histories with the following summary: These cases show the likelihood of the existence of a special type of osteomyelitis with the following characters. On the anatomic side there is a granulomatous reaction of the connective tissue of the intraosseous tissue with a certain amount of osteolysis. Such lesions are seen at a maximum in the spongy tissue of the bone, and the horizontal ramus infected by some microorganism forms a trough of compact tissue with concavity above, which is filled with exuberant granulations more or less purulent and bleeding. The process may extend to the entire horizontal ramus and involve the central portion of the ascending

ramus. On the clinical side there is no violent onset, and for some days the degree of pain is in sharp contrast with the absence of objective symptoms. Finally there are tumefaction, loosening of teeth and the formation of multiple fistulas. From the operative side prompt intervention will limit the process, this consisting of a curettage of the cavity. In this form of osteomyelitis there is evidently no possibility of sequestrum formation. The latter we may expect in the acute type of osteomyelitis, but in this subacute form we see, instead, proliferation in the connective tissue and rarefaction of bone. The radiodiagnosis of this condition is chiefly negative at first and hence of no value for early recognition. There may be transitions between the acute and subacute forms, for small sequestra may be found in the contents of the cavity.

Nutrition and Pediatrics

Gastrointestinal Reaction to the Emotions. C. W. Lueders, Arch. Int. Med., Aug., 1928, xlii, 2.

It has been generally accepted by physiologists and by psychologists that emotions such as anger, fear, pain, horror and repulsion, as well as anxiety, despondency and despair cause an inhibition of excretion and mobility, and this reaction occurs while the object arousing the emotion is still in consciousness.

The author states that these emotions by liberating an excess of epinephrin into the blood stream, or by acting on the sympathetic ganglions liberate sugar from the liver cells into the blood stream to such an extent as to cause transient glycosuria. However, from his study on 300 women patients with psychosis the author believes that chronic emotionalism and morbid moods through their protraction and summation have less and less effect on visceral functions but work their greatest harm at the higher levels.

X-Ray Action on the Growth and on the Internal Organs of Newborn Rabbits. Naotoshi Hoshi, J. Orient. Med., Nov., 1928, ix, 5.

Working in Darien General Hospital, Darien, South Manchuria, the author endeavors to ascertain the probable effects on the growth of newborn rabbits of a medium quantity of x-ray applied to their bodies. His conclusions show that the x-ray obstructs the growth in 64 per cent of these rabbits. The thyroid is slightly damaged by x-ray radiation.

Calcium Requirement and Diet During Growth. H. C. Sherman, New York State J. Med., Feb. 1, 1929, xxix, 3.

Sherman believes that one quart of milk a day is needed in addition to other foods if children between the ages of three and thirteen years are to fulfill their calcium requirement of one gram daily. No other food, vegetables for example, seems satisfactory as a substitute for the supply of available calcium for the body. If the child will not take milk as such, the author suggests that it be used in the preparation of the child's other foods.

Metabolism of Undernourished Children. C. C. Wang, M. Frank, M. Kaucher, Am. J. of Dis. Child., Nov., 1928, xxxvi, 5.

This is the sixth contribution made by Wang and his associates in the various phases of metabolism of undernourished children. As a result of their study of ten normal and twenty-six undernourished children, these investigators state, first, that in both classes no differences were found in the power to absorb food material; second, that the absolute number of calories absorbed varies directly with the intake per twenty-four hours; third, that the percentage absorbed is practically constant in all groups regardless of the degree of underweight or of the actual caloric intake; and fourth, that the actual caloric utilization varies directly with the caloric intake, the ratio between the two being constant.

Metabolism of Undernourished Children. C. C. Wang, J. E. Hawks, M. Kaucher, Am. J. Dis. Child., Dec., 1928, xxxvi, 6.

Wang and his associates at the Michael Reese Hospital, Chicago, performed two series of experiments on eight normal and nine undernourished children, using in the first series a high protein and in the second a low protein diet.

They found that a high protein diet is distinctly favorable to the child's growth and development, this being particularly true of the undernourished child. As much as 4 grams of protein per kilogram of body weight is recommended. Their high protein diet consisted mainly of one quart of milk plus a small amount of egg and meat. They believe that this amount of milk is necessary for optimum growth because of the quantity and quality of protein it contains in addition to its calcium and vitamine content.

Chronic Intestinal Toxemia in Children. Reginald Miller, Brit. M. J., Mar. 10, 1928, i, 383.

Miller calls attention to the type of child who is persistently out of health owing to chronic intestinal toxemia. The symptoms of this type of child are perhaps best summarized under the headings of unhealthiness and unhappiness. The characteristic appearance shows a thin, undersized child, pale, sallow and muddy complexion, eyes darkly ringed, coated tongue, often exhausted. Sleep is poor and disturbed, and sweating is common. The nervous symptoms are often so conspicuous that they are liable to mask the less evident intestinal symptoms.

Sometimes this type of child is shy, frightened, occasionally spiteful, and on the whole disappointing; often he is self-centered, emotional and, in short, everything that can make a child unpleasant.

There are reliable physical findings which distinguish this type from the so-called nervous child. These are: (1) enlarged abdomen; (2) abnormal stools; (3) gross indigestion as shown microscopically; (4) an abnormal amount of indican in the urine.

The principles of treatment outlined by the writer include a plentiful amount of rest, diet which restricts fat and fat foods and also roughage, aperients such as paraffin in its various forms, intestinal lavage and massage.

Diabetic Children. Elliott P. Joslin and Priscilla White, J. A. M. A., Jan. 12, 1929, xcii, 2.

In an excellent contribution the writers report on some of their experiences with diabetic children. In a previous contribution Joslin, who has advanced our knowledge of diabetes in children perhaps more than any other individual in the United States, stated that the incidence of heredity in the 201 fatal cases of diabetes in children was 17 per cent. At present Joslin and White report that all told over one-third, or to be exact 34.8 per cent, of the ancestors of their series of diabetic children also show some evidence of diabetes. In these days of preventive medicine this is indeed a timely warning to relatives of diabetic children to take care of their nutritional state or at least to avoid becoming obese if they wish to avoid diabetes.

These authorities go on record to state that diabetic patients may marry if they have proved themselves masters of their disease and, perhaps what is just as important, if they are financially able. It is also a common observation that diabetic children and children of diabetic mothers not only are large and attractive but also are mentally precocious.

Before the introduction of insulin, four-fifths of the cases in the authors' group of diabetic children ended fatally. Now the contrast is striking. For the period of twenty-two months preceding July 1, 1928, the mortality rate of their series is only one per cent, and these fatal cases were due to indifference or carelessness on the part of the parents.

Moreover, before the advent of insulin, about one-third of the diabetic children were at least 5 pounds below weight, and about one in five was also underheight. Today it is the exceptional diabetic child who is underheight or underweight. It is a matter of fact, however, that overheight at the onset of diabetes in children is a characteristic of the disease. In one hundred cases of diabetes in children the excess of height above the average was found to be 2.7 inches.

Although diabetes invariably is made worse by an infection, these authorities state that this is always temporary. During this period they advise more frequent doses of insulin, a slight reduction in protein intake, a greater reduction of fat intake, with a continuance of the carbohydrate intake.

The Paradentoses. Hoffmann (Munich), klin. Wchnschr., Jan. 29, 1929, viii, 5.

This long article appears in one of the leading German medical weeklies and is presumably meant solely for medical practitioners. The author first stresses the great and increasing importance of the subject. The paradentium is the retention apparatus of the teeth, the organ through which the teeth are retained in the jaw. It includes the bony alveolus with its periosteum and the membrane covering the root of the tooth (pericementum), a tissue which united the cementum to the alveolus. The gum also belongs to the paradentium—that is, its free margin does, protecting the neck of the tooth. Weski makes three regions of paradentium, the marginal, apical and intermediate, and many attempts have been made to classify the paradentoses. There is the distinction between the paradentites and paradentoses proper, between acute and chronic, between progressive and regressive, etc. The old term alveolar

pyorrhea is made up today of both paradentites (inflammatory processes) and paradentoses, both chronic. Quite distinct from these is acute marginal paradentitis, a very rare condition in which the teeth loosen and fall out. Since the war it is believed that more teeth are lost through the paradentoses than by caries. The familiar form of pyorrhea, beginning as a chronic gingivitis with pocket formation and deepening and secondary involvement of the bone, is a chronic paradentitis. Paradentosis is applied in this connection to non-inflammatory changes of constitutional origin, principally endocrinic, which lead especially in the more mature subjects to an immediate atrophy of the bone and other similar regressive changes including presumably those usually ascribed to old age. It is not practicable to distinguish sharply between paradentitis and paradentosis for they may be associated in the individual case.

When confronted by a case we have to consider three factors, the first of which is the exogenous element—the irritants, the rôle of bacteria, etc., in the pockets—and the amount of bone involvement as shown by the roentgenogram. The second is the functional status, the degree of loosening present; some dentists make three such stages. The third is the constitutional state of the individual, the investigation of which should be most exhaustive and left to the physician and laboratory men. This diagnostic trinity also serves to supply the indications for treatment which consequently should involve first the removal of all irritation and combating the inflammation, second wiring the teeth, and third the general management based on the laboratory findings. Dentist and physician should cooperate closely in these cases. Cases are divided according to the severity of the treatment: the mild explains itself, the medium may require gingivectomy, while in the severe degree the radical operation will be required. Prophylaxis also requires the services of both physician and dentist.

Rheumatic Fever as a Manifestation of Hypersensitiveness (Allergy or Hypergy) to Streptococci. Homer F. Swift, C. L. Derick and C. H. Hitchcock. Tr. A. Am. Physicians, 43, May, 1928.

Swift and his associates present evidence to support the theory that the symptom complex of rheumatic fever is merely a manifestation of the individual's hypersensitiveness to streptococci.

Most patients with rheumatic fever present evidence of a persisting focus of infection somewhere in the body, usually in the form of chronic tonsillitis, sinusitis, or other infection of the upper respiratory tract, and these foci represent areas where the sensitizing substance is produced. Certain individuals are in a condition of hypersensitiveness to streptococci resulting from these repeated low grade infections. Under suitable circumstances streptococci and products of streptococci are distributed from these foci of infection to the tissues, and when certain tissues over-react the characteristic picture of rheumatic fever results. When, on the other hand, a state of immunity without this peculiar hypersensitiveness exists, the dissemination of streptococci results in a minimum of injury to the tissues, and the characteristic phenomena of the disease fail to appear.

Skin Reactions of Patients With Rheumatic Fever to Toxic Filtrates of Streptococcus. Homer P. Swift, May G. Wilson and E. W. Todd. Am. J. Dis. Child., xxxvii, 1, January, 1929.

Because green streptococci have been repeatedly found in the blood or lesions of patients with rheumatic fever, these investigators determined the skin reactions to toxic filtrates of various streptococci.

The clinical material consisted of children with rheumatic heart disease at the New York Nursery and Child's Hospital, and of patients with active rheumatic fever in the wards of the hospital of the Rockefeller Institute.

Among the many interesting findings was that patients with rheumatic fever gave a higher positive skin reaction with filtrates of both indifferent and green streptococci than did nonrheumatic controls.

Moreover, patients with active rheumatic fever gave a higher proportion of skin reactions with these filtrates than did those with inactive or "cured" rheumatic fever.

These authorities feel that the positive reactions in patients with rheumatic fever seem to depend more on their state of hypersensitiveness to certain products of streptococci than on the specificity of any one type of streptococcus.

The Treatment of Rheumatism. Harlow Brooks. Tr. A. Am. Physicians, May, 1928.

Brooks advocates a full diet in his treatment of rheumatism; first, to repair tissue waste; and second, to correct the marked tendency to anemia which appears in the disease.

Regarding the drug treatment of rheumatic fever, he feels that the salicylates are indispensable. Some patients tolerate one form of the drug better than another. The writer states that the therapeutic effect of the salicylates can apparanely be greatly augmented by a combination with salts of magnesia. The alkaline treatment also has real value, used either alone or associated with salicylates. Water is a therapeutic value of definite utility.

Foci of infection should be attacked most cautiously during the acute phases of the disease, since their disturbance appears in some instances to greatly activate the virulence of the case. According to Brooks, drainage of all infected foci should be established whenever it is possible.

The writer stresses the importance of proper bed management, and states that due care to small details contributes much to hasten convalescence.

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EDITORIALS

The Cost of Dental Service

SEVERAL months ago the American Medical Association with the aid of other similar organizations undertook to make a national survey regarding the cost of medical service. This survey was made because it was claimed that hospital and other medical service was continually increasing in price and that it had reached such heights that the average family could not avail itself of hospital facilities and the sick could not be properly cared for.

Such statement has also been made in reference to dental service. We admit that valuable information is obtained from surveys, but there are a few facts that are obvious and need no elaborate survey to determine their truth.

The average family does complain about the cost of medical and dental service, yet in comparison with other things that people purchase, dental and medical fees are not at all exorbitant. The people seem to think that medical

and dental care is an accident, which to some extent it might be, but they make no provision for it and do not consider the value of the service rendered or the cost of rendering it.

If people could be educated to realize that dental service is more important than a great many other things which they purchase, this complaint of overcharge would not be heard.

We have known instances where women will pay $250 for a dress and resent the payment of $200 for a bridge or denture. It has been claimed that seventeen million dollars were spent last year for cosmetics; this commodity cannot be classed as a necessity. A woman will spend $5 for a box of Elizabeth Arden face powder, but she will complain on being charged for having her teeth cleaned. She will spend $5000 for a fur coat and complain because the orthodontist charges $1000 for correcting the malocclusion of her child. A man will have a new motor car each year and complain when he has to have a restoration made in his mouth.

We contend that the cost of medical and dental service is not high in comparison to other necessities and is certainly not high in comparison to luxuries which people gladly pay for.

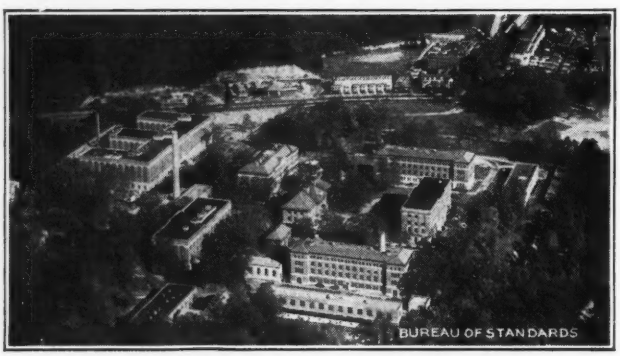
Just what the solution is to this problem we do not know, but we believe education would do much. How to educate the public to appreciate medical and dental service and to be willing to pay as much for that service as it does for cosmetics, is indeed a problem. The power of education, however, is very evident when we remember that a few years ago the automobile manufacturers tried to educate the public to the necessity and pleasure of owning cars. After they had succeeded in exhausting a large supply of first purchasers, they began to educate the public to the necessity of having two cars, and succeeded to a great extent. Real estate men in selling houses, in years past, called attention to the fact that a house had a garage, now they say a house with a two-car garage.

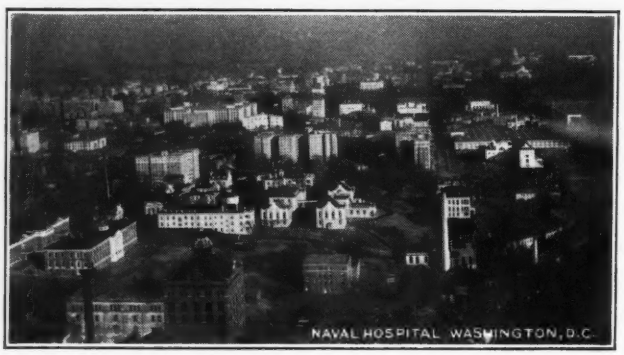
We can almost see some of the old timers raising their eyebrows and accusing us of believing in advertising, and we will acknowledge this accusation to a certain extent. However, the solution of the complaints regarding the high cost of medical and dental service lies in educating the public to a real appreciation of such service. When we succeed in getting people to realize that it is more important for the child to have his adenoids and tonsils removed than it is for his mother to have a diamond bracelet, such complaints will cease to be made.

ORTHODONTIC NEWS AND NOTES

The Coming American Dental Association Meeting at Washington—The Center of Dentistry

In no other city of this country are there to be found more complete facilities for the study and advancement of the dental profession than in Washington. We who practice dentistry feel exceedingly fortunate that we have within our limits all the advantages that are to be had in the science and practice of modern dentistry.

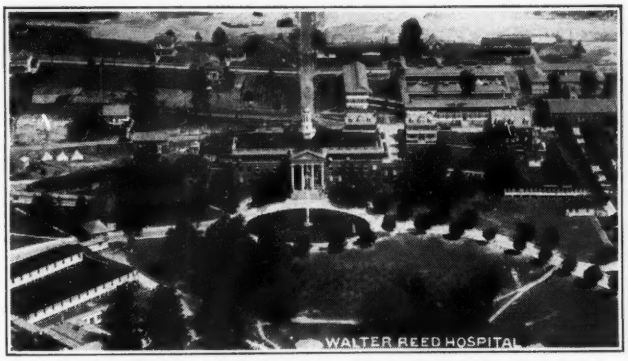


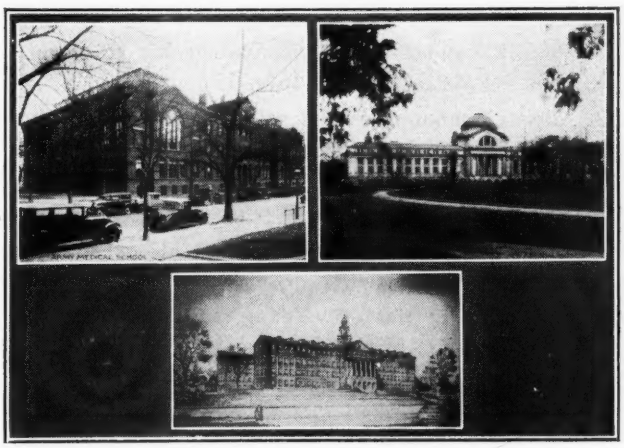


The Bureau of Standards, one of the most interesting and practical departments of the Federal Government, in recent years has accomplished much for dentistry, and Dr. Taylor has been employed by the American Dental Association to cooperate with the Bureau. Here is to be found a standard for every material used in the dental profession. Tests are conducted for the expansion and contraction of alloys mixed with mercury, for the strength of golds and cements, the best investment and impression materials, and many other invaluable experiments. Recently it was found that out of more than thirty samples of alloy manufactured in this country not more than six met the standard.

In the National Museum there are more than 2,000 skulls which are available for study by members of the dental profession. At Walter Reed Hospital (the army medical center) and at the Naval Hospital are two finely equipped clinics in which many experiments are carried on. The new Georgetown University Dental School, now under con-

struction, when completed will have three hundred dental chairs with units, laboratories, and special laboratories for prosthesis, operative and bacteriologic work. In this institution modern dentistry will be taught. The Army Medical Museum has a complete library of all medical and dental books and magazines and numerous specimens showing pathologic conditions, while in the Library of Congress there are more than 1,500 volumes on dentistry, occupying 57 shelves. There are nearly 900 entries for works on dentistry in the library catalogue.





Altogether, Washington provides extraordinary advantages for the study of dentistry and for the dental profession. Members of the American Dental Association at the coming annual meeting, October 7-11, will have splendid opportunity to avail themselves of these rare opportunities.

Notes of Interest

Dr. Stanley A. MacKenzie announces the removal of his office to 1011 Stroh Building, Detroit, Michigan.

Dr. Walter Coolidge Chapin announces the removal of his office to 20 East 53rd Street, New York, N. Y. Practice limited to orthodontia.

Dr. Brooks Juett wishes to announce the opening of an office at Suite 804 Guaranty Bank Building, Lexington, Kentucky. Practice limited to orthodontia.

Dr. Walter E. Wade of 363 Marlboro Street, Boston, wishes to announce the opening of a summer office at Wellfleet, Cape Cod. Practice limited to orthodontia.

Dr. Sylvain Dreyfus is now located at 6 Avenue de Rumine, Lausanne, Switzerland.

Dr. Charles A. Spahn announces the removal of his office to 654 Madison Avenue, New York City.

Dr. Hays N. Nance, formerly associated with Dr. Albert H. Ketcham of Denver, Colorado, in the practice of orthodontia, announces the removal of his office from Denver, Colorado, to 733 Pacific Mutual Building, 523 West Sixth Street, Los Angeles, California. Practice limited to orthodontia.

Dr. John Henry Madden, associate of the late Dr. Victor Hugo Jackson, announces the opening of his office at 18 East 48th Street, New York, N. Y. Orthodontia exclusively.

Dr. Stanley Milton Dow announces his succession to the practice of the late Dr. Roloff B. Stanley and will continue the practice of orthodontia. 45 Park Avenue, New York City; 5 Popham Road, Scarsdale, N. Y.

Dr. Carl B. Case announces the removal of his office from 410 Jefferson Street to Suite 622-627 Bankers Building, Corner Wisconsin Avenue and East Water Street, Milwaukee, Wis. Practice limited to orthodontia and cleft of the palate.

Dr. Maurice William announces the removal of his office to 130 West 57th Street, New York. Practice limited to periodontia, prophylaxis and mouth diagnosis.

Dr. R. Burke Coomer announces the removal of his office to Suite 629 Breslin Building, Louisville, Ky. Practice limited to orthodontia.

Dr. Milo Hellman announces the removal of his office to 57 West 57th Street, New York.

Dr. Winston P. Caine announces the removal of his office to Suite 707-709 Medical Arts Building, 544 McCallie Avenue, Chattanooga, Tennessee. Practice limited to orthodontia.

Dr. Charles J. Vosmik announces the removal of his office to 1334-38 B. F. Keith Building, Cleveland, Ohio. Practice limited to orthodontia.

Dr. Charles S. Adelstein announces the removal of his office to 929 Rose Building, Cleveland, Ohio. Practice limited to orthodontia.

Dr. G. S. Callaway, formerly associated with Dr. J. Lowe Young, announces that his office is now at 38 East 61st Street, New York. Practice limited to orthodontia.

Dr. Norman L. Hillyer announces the removal of his office to Professional Building, Hempstead, New York. Practice limited to orthodontia.

Dr. J. Lowe Young and Dr. Glenn F. Young announce their association as partners in the practice of orthodontia at 18 West 74th Street, New York City.